The New England
Journal of Medicine

Copyright, 1949, by the Massachusetts Medical Society

Volume 241 SEPTEMBER 22, 1949 Number 12

HOME ACCIDENTS IN MASSACHUSETTS*

A Study in the Epidemiology of Trauma

HELEN L. ROBERTS, M.D.,† AND JOHN E. GORDON, M.D.‡

BOSTON

SELECTED features of a comparative study of accident mortality in Massachusetts and in the United States are presented here to illustrate a serious community health problem that receives too little attention. The direct objective is to determine by epidemiologic analysis the features of accident prevention that warrant special consideration in Massachusetts. We are keenly aware that to study accidental deaths without concurrent attention to temporary and permanent disability is to under-rate greatly the medical, economic and social seriousness of the problem. In the absence of specific morbidity data, deaths necessarily serve as the index.

Although the total death rate from accidents in the United States decreased from 85.5 per 100,000 population in 1918 to 69.7 in 1947,[1] the relative importance of accidents as a cause of death has increased, owing to improved control of other diseases. Deaths from accidents ranked fourth in 1946 in both Massachusetts and in the United States (Fig. 1), as compared with sixth position in 1935.[1]

Massachusetts has a considerably lower rate than the country as a whole. The provisional rates by states for 1947, published by the National Safety Council,[1] give Massachusetts an enviable comparative standing, since only Connecticut, Rhode Island and New Jersey had better records. The favorable rates of recent years are no isolated circumstance. Figure 2 shows that since 1913, the death rate from accidents has been lower for Massachusetts than for the United States generally in every year except 1942, when Massachusetts suffered the Cocoanut Grove disaster. The data suggest that, in comparison with other regions, effective control measures

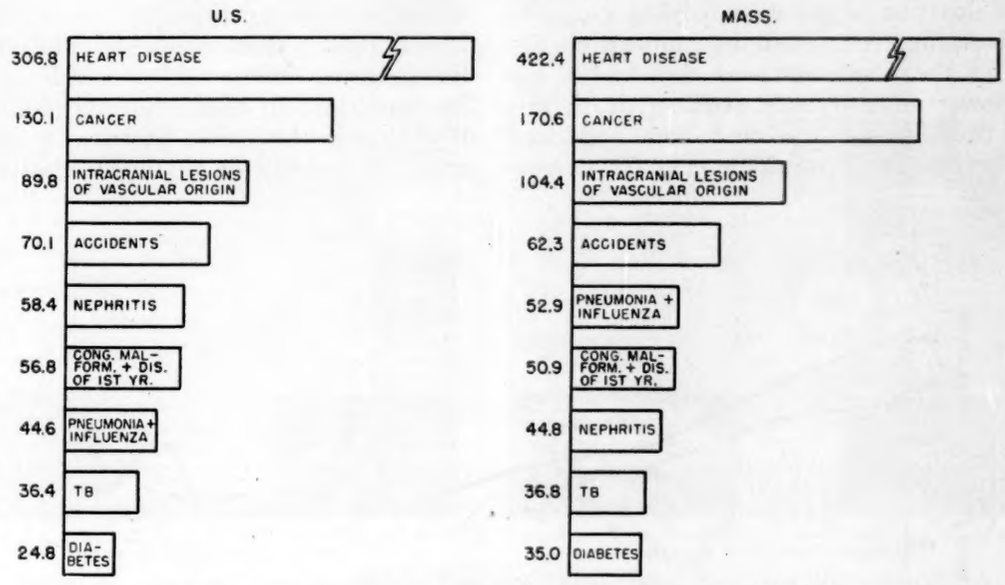

FIGURE 1. *Chief Causes of Death, United States[2] and Massachusetts,[3] 1946 (Rates per 100,000 Population).*

*From the Harvard School of Public Health, departments of Public Health Practice and Epidemiology.

†Associate in public-health practice.

‡Professor of preventive medicine and epidemiology.

are already in operation or, alternatively, that citizens of the Commonwealth are, by reason of training, age or environment, more accident resistant than the residents of most other states. Unfortunately, the situation is not so satisfying when the rates for Massachusetts are examined more precisely.

Since 1923 the Commonwealth has had a significantly lower motor-vehicle accident death rate than the United States as a whole.[3] Total accidental deaths, other than motor vehicle (Fig. 3), demonstrate no significant difference between Massachusetts and the United States over the past twenty years. When states are grouped by accidental deaths other than those involving motor vehicles, Massachusetts is in the third quartile — a group with rates varying between 48.0 and 53.9 per 100,000 population.[4]

If accidents are divided into classes by place of occurrence (Fig. 4) the fatal accidents that occur in homes are proportionately more important in Massachusetts than in the United States generally. By contrast, motor-vehicle accidents were much less important in Massachusetts (20.2 per cent) in 1947 than in the United States as a whole (32.3 per cent). Pedestrian deaths were relatively more important, as would be expected in a highly urban community. Accidents in public places (nonmotor vehicle), accounted for a larger percentage of accidental deaths in Massachusetts than in the United States as a whole. Massachusetts had a better than

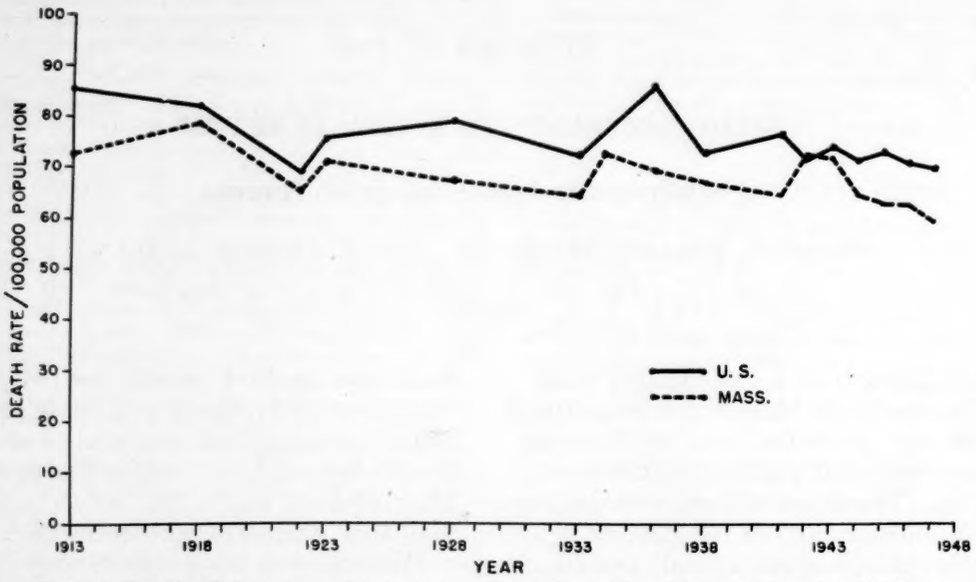

FIGURE 2. *Death Rate from All Accidents, Massachusetts[3] and United States,[1] 1913-1947.*

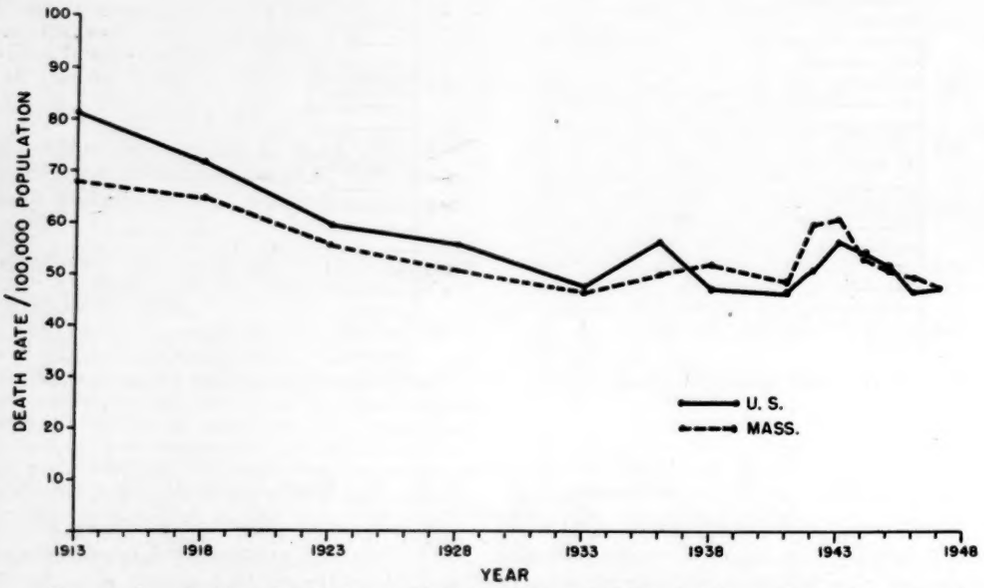

FIGURE 3. *Accident Death Rates, Excluding Motor-Vehicle Accidents, Massachusetts[3] and United States,[1] 1913-1947.*

average record for accidental deaths in the course of occupation.

Many environmental and social conditions determine the kind of accidents peculiar to a community. In 1945 only one state exceeded Massachusetts in death rates from falls and crushing injuries.[6] Serious falls are a function of age, and Massachusetts has an older population. This accounts in part for the observation that falls in 1946 were responsible for 26 per cent of all accidental deaths in the United States, whereas in Massachusetts the figure was 44 per cent.

reason for satisfaction. There is the added consideration that the average experience of as large a geographic area as a state cannot reasonably be used by a community to judge its individual accident problem. Variations in housing, crowding, age distribution and economic levels strongly influence the frequency and kind of accidents.

Epidemiology

Deaths from accidents in the United States in 1947 numbered approximately 100,000. Home acci-

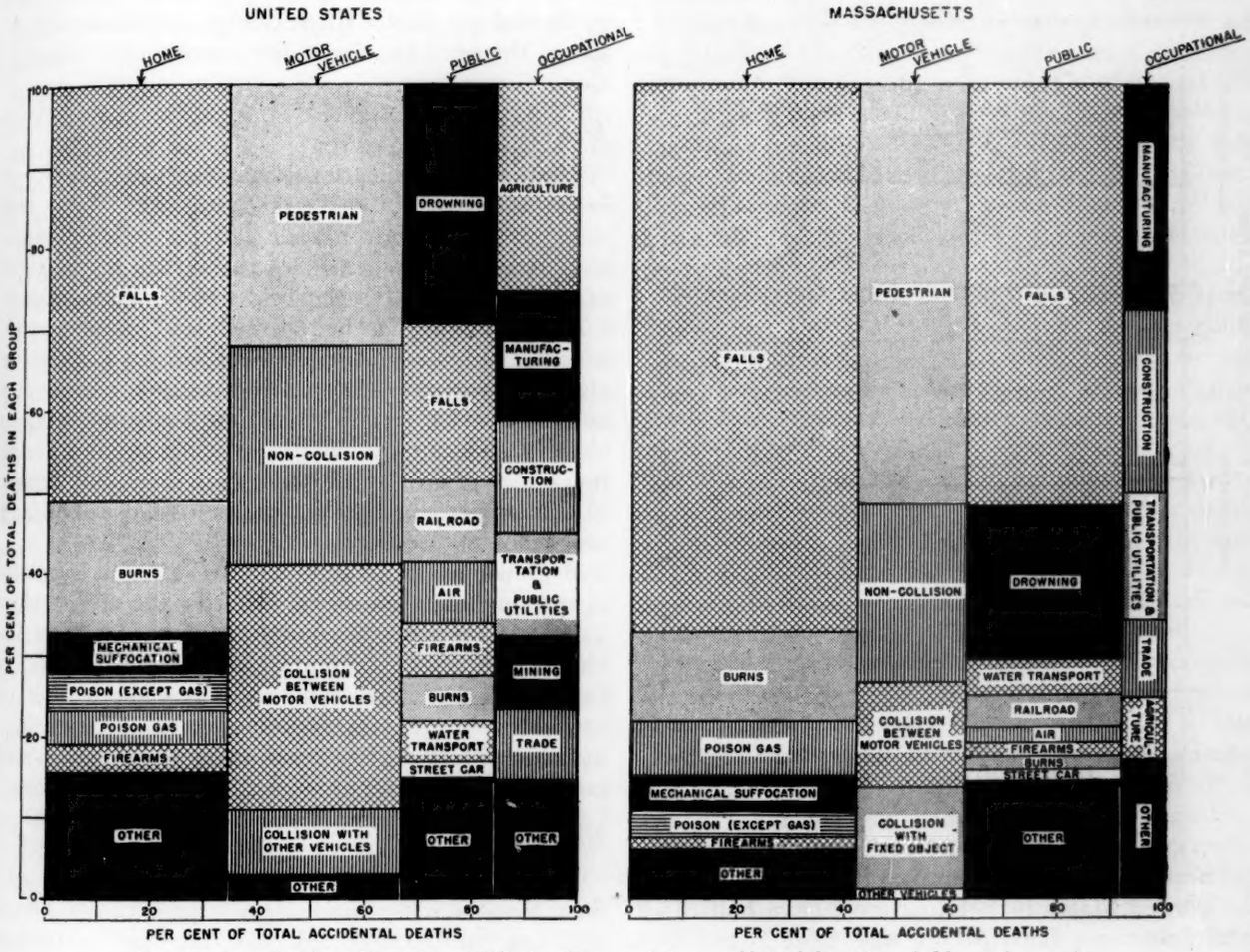

FIGURE 4. *Accident Mortality, 1947, by Class and Cause, United States[1] and Massachusetts.[5] Based on data of Kansas State Board of Health.[9]*

Comparison of other epidemiologic variations in accidental deaths, such as seasonal and sex incidence, shows no marked differences between the two regions. The outstanding disparity that calls for special effort in Massachusetts is the excess of home and public accidents (Fig. 5), falls being the paramount factor in each. That Massachusetts has a more serious problem, in these respects, is no reason for lack of attention to other areas of accident prevention. No part of the United States has so controlled accident morbidity or mortality in any age group or in any class of accidents as to have great

dents accounted for more than a third (34,500) of the deaths and half (5,200,000) of the disabling injuries.[1] For every death from a home accident there are approximately 150 disabling injuries, of which 4 result in some permanent defect. No one of the other three classes of accidents — motor-vehicle, public and industrial — is responsible for so many deaths or disabling injuries. Home accidents alone were the ninth leading cause of death in the United States in 1946.[2]

The trend of home accidents, as judged by deaths, has shown remarkably little fluctuation from 1930

to 1947. The annual rate, which is usually about 24 per 100,000 population, in seventeen years has not been less than 23, and rarely exceeds 25. An all-time high of 29 occurred in 1936. In 1947 home-accident deaths increased 5 per cent over 1946, and except for 1936, the rate was the highest on record.[1] In this uniform trend, home accidents have not paralleled the improvement shown for accidents as a whole, for industrial accidents, or for motor-vehicle deaths.[1]

Six types of accidents are responsible for 85 per cent of home-accident deaths. Falls are numerically

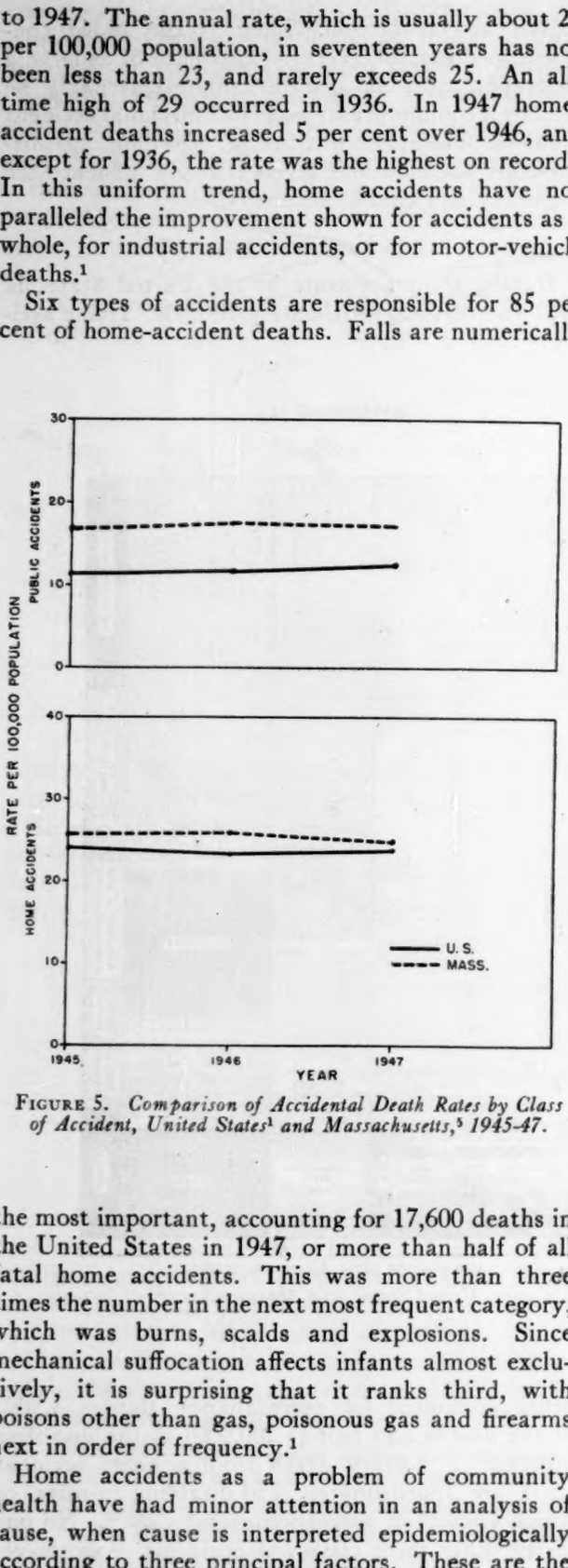

FIGURE 5. *Comparison of Accidental Death Rates by Class of Accident, United States[1] and Massachusetts,[5] 1945-47.*

the most important, accounting for 17,600 deaths in the United States in 1947, or more than half of all fatal home accidents. This was more than three times the number in the next most frequent category, which was burns, scalds and explosions. Since mechanical suffocation affects infants almost exclusively, it is surprising that it ranks third, with poisons other than gas, poisonous gas and firearms next in order of frequency.[1]

Home accidents as a problem of community health have had minor attention in an analysis of cause, when cause is interpreted epidemiologically according to three principal factors. These are the direct etiologic agent, such as the micro-organism in a communicable disease or the loose floor board in a home accident; the characteristics of the host who develops the disease or suffers the accident; and the environment in which the host and the agent exist.[7]

Earlier publications[7, 8] have shown that accidents follow the same biologic laws as other morbid processes that involve groups of people, and hence are susceptible to the same methods of epidemiologic study so valuable in the communicable diseases and now applied to mass disease in general — to diabetes, cancer and many others.

The collection and arrangement of home-accident data according to etiologic factors that relate to agent, host and environment are believed essential to proper weighting and evaluation. They permit specific preventive measures to be applied to important causes in a given community. This framework is now used to present some of the known epidemiologic facts about home accidents and to gauge the need for the collection of added information.

Etiologic Agents

The usual classification of home accidents by type is useful in describing the mechanism of injury, but does not provide information about the direct causative agent or the activity of the victim at the time of the accident. If the accident is a burn, was it due to smoking in bed, to a child playing with matches in the mother's absence or to defective electrical wiring? The potential number of agents in falls is even greater than that for burns, and to classify all such accidents by mechanism alone is to mask the causative relation of such dissimilar agents as a misplaced toy, structural defects in a building and a hole in a driveway.

A few investigators[9-11] have studied specific agents in home accidents, but the knowledge thus gained is far from adequate. No studies have included the home accidents that disable the person for only a day or so. No one has enough data to evaluate the varying importance of a particular agent in different geographic areas or under diverse conditions of living, as in rural and urban regions.

Host Factors

Except for the simpler matters of age and sex, host factors have been largely ignored in home-accident studies, although receiving much attention in motor and industrial accidents. They are increasingly appreciated as significant etiologic factors in all accidents. The analyses published by the Kansas State Board of Health[9] suggest the importance of existing physical disability, especially in the older age groups. The relation of temporary emotional tensions to home accidents is unknown, as is the role of alcohol and drugs. It is known that some people have an unusual number of accidents in any situation, and that this proneness is unrelated to intelligence, reaction time, experience or physical constitution. Accident proneness has been studied in motor[12] and industrial accidents,[13] but its part in home accidents has yet to be appraised.

Much is known about age as a determining host factor. Deaths are most frequent among infants and the aged, not only because they spend most of their time in the home but also because they are least able to guard against an unfavorable environment. In 1946, 70 per cent of all fatal accidents in children under five were home accidents. Rates for infants were three or four times those for older pre-school children. Essentially two thirds of all fatal accidents that affected persons over sixty-five years of age in 1947 were home accidents, the rates being 185.0 as contrasted to 42.4 for children under five.[1] As suggested by Britten et al.,[14] it may be misleading to judge the actual incidence of home accidents on the basis of death or serious disability, because an accident with serious consequences in an aged person may be of little moment for a young adult.

The kinds of fatal accident in the home differ markedly for various age groups. Burns were the most common fatal accident, in the data for the United States, at all ages under forty-five years, with the exception of persons in the age group of fifteen to twenty-four years, in which death from firearms ranked first and burns second. Falls were relatively unimportant among children, but became increasingly prominent after the age of twenty-five years, so that in persons over sixty-five years, 77 per cent of all home-accident deaths in the United States in 1946 were of this nature.[1] The Kansas Accidental Death Report[9] points succinctly to the fact that falls in the elderly and infirm unduly weight the results. In 1947, in Kansas, 60 per cent of accidental deaths in the home were due to falls, but of these only 5 per cent involved persons under sixty-five years of age and in apparent good health.

Sex, like age, is a significant host factor. Deaths from all accidents, other than motor vehicle, involve males much more frequently throughout life than females. If only disabling home accidents are considered, as in the National Health Survey,[14] males predominate up to the age of twenty-five years, and thereafter, serious home accidents happen more often to females, so that the annual frequency rate for females for all home accidents was almost one and a half times that for males. There are 2 fatal home accidents in elderly females for every 1 among elderly males.

An outstanding sex factor was noted by Brown and his associates[15] in Kansas and Nassau County, Long Island: the number of boys dying in home accidents between the ages of one and fifteen years was twice that for girls, despite the reasonable belief that the hours of exposure were much the same, and certainly no greater for boys.

Environmental Factors

The causal factors arising from the environment have been studied more exhaustively than those of the agent or host. The frequency of fatal home accidents varies markedly from one state to another. For 27 states reporting in 1947, Missouri had the highest rate, 34.5, and Utah the lowest, 16.8. Evidently the variables in home-accident rates do not correlate with total accident death rates, which were 74.5 for Missouri and a high of 82.9 for Utah. Rates vary more markedly with the concentration and type of population in a given community than with its geographic location. Thus, in 1947, home-accident death rates for urban areas were 31 per 100,000 population, for farm homes 26, but for rural nonfarm regions only 14 per 100,000.[1]

Several studies have established various areas within the home as an environmental factor. An analysis of 987 fatal home accidents in Kansas and Nassau County, Long Island,[1] showed that a fourth occurred in the bedroom, because most deaths of infants and the aged were there. The yard and then the kitchen were next, followed by stairs, with other locations much less frequently the site of a fatal home accident. The studies of the Metropolitan Life Insurance Company[16] of nonfatal home accidents showed the kitchen to be the most hazardous home area.

In Massachusetts[3] there is a marked seasonal fluctuation in the frequency of home-accident deaths, with recurring peaks in December or January, and low rates in September, as indicated by the years 1945–47. Individual types of home-accident deaths vary markedly with season. Falls, burns of all types and deaths by poisonous gas are more frequent in the winter months, whereas deaths from poisons other than gas and from firearms show little seasonal variation. The influence of various hours of the day or night, holidays, week ends and periods of bad weather is unknown.

A marked correlation between socioeconomic factors and the frequency of home accidents is often assumed, but with little factual data to support the hypothesis. The best information comes from the National Health Survey of 1935–36[14] in which the frequency rate for all home accidents causing disability of at least one week decreased from 6.01 per 1000 persons for families on relief to 4.10 for families with annual incomes of $1000 to $1500, and thereafter in the higher income groups a relatively stable rate was attained.

As is true of disease, no one of the three causative factors acts singly to result in the injury or produce the accident. Some one element may predominate, but ordinarily all interact. Since home accidents as a community health problem are primarily the concern of the medical profession and public-health departments, they are approached most readily and most practically by the methods that preventive medicine and public health have utilized for other health problems that affect masses of people — the epidemiologic approach. As applied to home accidents, the epidemiologic method is simply the collection and analysis of all the facts in a given area. The things to be known in terms of mortality and

morbidity are when and where accidents occur, how they occur and to whom the accident happens. This includes a study of the site of the accident, the behavior and characteristics of the person affected, his activities at the time of the accident and, finally, the specific agent causing the accident.

Blanket-control measures have proved unproductive and expensive in any public-health program. What is needed is sufficient knowledge of the occurrence of the disease in a given community to permit a specific attack on the principal problems presented and on the most accessible link in the chain of causation. To date, not only is knowledge of the circumstances of home accidents for the country as a whole insufficient but also the available data are too often collected indiscriminately and tabulated without definite epidemiologic objectives. An evaluation of the home-accident problem, based on deaths alone, results in a distorted view of the situation.

Since home accidents vary markedly from community to community, and since few regions have adequate knowledge of nonfatal home accidents, or of the circumstances surrounding fatal mishaps, we believe that a town or county can, to advantage, study its own home accidents as the first requisite to an efficient control program. Similarly, a state control program should be preceded by representative studies of the population with samples drawn from rural, industrial, suburban, village and town areas. The kind of accident study will depend on the method selected for finding cases, and upon the finances and personnel available. The survey may be one or a combination of the following:

Study of accidental deaths in the community. An analysis of deaths resulting from accidents, without subsequent study of accidents of less serious consequence, omits the bulk of accidents in the community. As a preliminary, such a study may be valuable, particularly if a complete, individual analysis of the circumstances of each death is made. Such studies of fatal accidents in Kansas over prolonged periods have added materially to knowledge of accident etiology.

Study of home-accident cases admitted to hospitals. Most of the more serious home accidents may be assessed by a continuing study of admissions to hospitals within the area. Hospital records alone are usually insufficient to supply the necessary epidemiologic data, but can be enlarged by an accident history obtained from the patient or a member of his family, a study of the site of the accident and the co-operation of the attending physician.

Organized survey in selected areas. The most satisfactory epidemiologic data are obtained by house-to-house survey, using trained investigators and a sufficiently large sample of the population to ensure statistical accuracy. It appears purposeless to study accidents with a disability of less than one day; if the index is a disability as long as a week, many socially and economically important accidents will be missed, especially among children and young adults. Therefore, a disability extending beyond the day the accident occurred is a reasonable inclusion index. The obvious disadvantage of the organized survey is cost, which for many communities is prohibitive.

Incorporation of the accident study into the routine activities of the health department. This is a reasonable compromise. If the health department is making other continuing surveys, the accident study may be included, using the same personnel entering the home for the original study. What is even more practical, the public-health nurse may inquire about the circumstances of home accidents as a part of visits for other purposes. Such studies are now under way in two suburban towns in Massachusetts, and a third has been started by the health department of a large industrial community. In each region, the nurses of voluntary agencies and of the health department co-operate in investigating and recording accidents occurring on home premises within the preceding thirty days.

A convenient record form provides the necessary epidemiologic data for developing a specific educational program. The household roster, often already in the nurses' record, is used as a base in the calculation of hours of exposure. Persons other than nurses may aid in such studies, but we have no experience as yet to indicate how necessary trained personnel and professional qualifications may be in the success of the survey.

The ultimate control program, as described by Brightman[17] for New York State and by the Subcommittee on Accident Prevention of the American Public Health Association,[18] will center around education, especially directed to groups of people who have the most accidents. It will include continuing epidemiologic studies, case finding and the treatment of the accident prone, especially children. Administratively, experience must be accumulated on what constitutes a feasible control program, and on the means for evaluating the success of a program.

Summary

The interest in accidents engendered by the modern motor car and long fostered by industry has, in recent years, been extended to the other and numerically more important accidents that occur in the home. There is need for greater appreciation of the costs of accidents and realization of the fact that they can be prevented. The obligation of the moment is to co-ordinate the activities of multiple voluntary and official community agencies into an effective home-accident control program. Its success depends on the same analytic and scientific methods by which all community health problems are approached: the epidemiologic survey.

References

1. National Safety Council, Statistical Bureau. Accident Facts. (Annual publication.) Chicago: National Safety Council, 1921-1948.
2. National Office of Vital Statistics, United States Public Health Service Federal Security Agency (FSA-318). Release dated December 30, 1947.
3. Commonwealth of Massachusetts, Office of the Secretary, Division of Vital Statistics. Annual Reports on the Vital Statistics of Massachusetts, 1913-1947.
4. National Office of Vital Statistics, United States Public Health Service, Federal Security Agency. *National Summaries* **29**:57-78, 1948.
5. Monthly Compilations of Accident Fatalities made for the National Safety Council by the Massachusetts Division of Vital Statistics. Furnished through the courtesy of the Massachusetts Division of Vital Statistics and the Massachusetts Safety Council.
6. National Office of Vital Statistics, United States Public Health Service, Federal Security Agency *Accident Fatalities in the United States, 1945*. **27**:347-365, 1948.
7. Gordon, J. E. Home accidents as community health problem. *Am. J. M. Sc.* **217**:325-344, 1949.
8. *Idem.* Epidemiology of accidents. *Am. J. Pub. Health* **39**:504-515, 1949.
9. Kansas State Board of Health. Kansas Accidental Death Reports, 1932-1948.
10. Armstrong, D., and Cole, W. G. Home accidents, where, how and why. *Safety Magazine*, December, 1940.
11. National Safety Council. Hurt at home. 11 pp. Reprinted from *Public Safety Magazine*, Chicago. 1936.
12. Farmer, E., and Chambers, E. G. *A Psychological Study of Individual Differences in Accident Rates* Report No. 38. 46 pp. London: His Majesty's Stationery Office, 1926. *A Study of Accident Proneness among Motor Drivers*, Medical Research Council, Industrial Health Research Board, Report No. 84. 56 pp. London: His Majesty's Stationery Office, 1939.
13. Drake, C. A. *Personnel Selection by Standard Job Tests*. 147 pp. New York: McGraw-Hill Book Co., 1942.
14. Britten, R. H., Klebba, J., and Hailman, D. E. Accidents in urban home as recorded in National Health Survey. *Pub. Health Rep.* **55**:2061-2086, 1940.
15. National Safety Council. Special Report, unpublished, 1948.
16. Danger in kitchen. *Statist. Bull. Metrop. Life Insur. Co.* **28**:6-8 (February), 1947.
17. Brightman, I. J. Place of home accident prevention in public health program. *Am. J. Pub. Health* (in press).
18. American Public Health Association, Subcommittee on Accident Prevention. Accident prevention — essential public health service. *Am. J. Pub. Health* **35**:216-218, 1945. Suggested home safety activities: for consideration of local health departments. *Am. J Pub. Health* **35**:219, 1945.

THE NEEDS FOR INPATIENT CARE AND TREATMENT OF MENTALLY ILL CHILDREN IN THE COMMONWEALTH OF MASSACHUSETTS

THADDEUS P. KRUSH, M.D.*

WALTHAM, MASSACHUSETTS

IN PSYCHIATRY in the past thirty years there has been a gradual, increasing interest in progressing downward along the chronologic scale toward childhood to seek out the earlier phases of personality deviations. To search for a means of straightening the bent twig while it is still in the process of bending appears all too obvious, but the surprising feature is the fact that it has taken so long to turn attention in this general direction. That the "hopeful" aspect of psychiatry exists in child psychiatry should be reasonably apparent to anyone who has spent long hours in individual or group therapy with mentally ill adults in an attempt to delve backward into their repressed conflicts or to enable them to obtain sufficient insight to be able to accept and deal with their environmental stresses of the moment. These patients have been chronically ill by the time that clear-cut psychotic or psychoneurotic adaptations appear.

Except in extreme deviations, the child exhibits no such well defined clinical syndromes, but the need for closer observation and classification is here necessary if the developing dynamisms of adult mental illness are to be better appreciated.

Although child guidance has done much to add to knowledge in this respect, there also appears to be a need for inpatient care and treatment of mentally ill children, particularly those exhibiting problems centered around marked withdrawal, running away, extreme aggressiveness and hyperactive-distractible types of behavior. The first named need hospitalization to be afforded a permissive, noncompetitive haven; the second need to be maintained in a therapeutic situation for a sufficient length of time to form a relation with the therapist and more adequately to test reality; the third need some environment to contain aggressiveness until they become more aware of the source of their hostility, for they certainly do not become more secure nor is their antagonism abated by a continual shuffling of foster homes; the fourth need investigation of the central nervous system for diffuse neurologic defects and a mobilization of intellectual assets in a nonfrustrating environment. All need a multidiscipline approach to their personality disabilities to assure as rapid rehabilitation to society as possible.

In December, 1945, the Metropolitan State Hospital was designated by the Massachusetts Department of Mental Health as the institution to which all psychotic children in the Commonwealth were to be sent. During this and the following months, such psychotic children as were scattered throughout the Department's institutions were transferred to this hospital, which then began to receive severe behavioral deviants from the community. Two 50-bed wards were taken from existing overcrowded adult facilities to house the increasing influx of children. A critical evaluation of the inpatient mental facilities for children in the state is in order so that reasonable short-term and long-term goals can be established to achieve care and treatment of this group of the population.

In Massachusetts approximately 23,000 adults are at present patients in state mental hospitals. If the seed of mental illness is planted during childhood, to come to full fruition in adulthood, it seems likely that more than half of 1 per cent of the

*Clinical director of psychiatry, Children's Unit, Metropolitan State Hospital.

present capacity of institutions should be set aside for the study, care and treatment of children's mental disorders. The present admission rate of approximately 300 per year tends to confirm the need for this type of hospitalization.

Some alteration of the scope and purpose of this unit, originally conceived as one to which psychotic children could be sent for care and treatment, has been necessary, owing to the following circumstances: the prevailing types of commitment procedures, the existing confusion regarding what constitutes psychosis in childhood and the community needs for the mentally ill child.

At present a patient may be committed to the Children's Unit under Section 79, 77, 51, 100, 86 or 86A of Chapter 123 of the *General Laws*. With the exception of Sections 86 and 86A no refusal of admission exists; hence, practically all children sent to the unit are admitted, physical facilities notwithstanding. Although this is moderately frustrating to the personnel involved in the diagnosis, care and treatment of these children such procedures serve the useful purpose of funneling all patients under the age of sixteen considered by the Commonwealth to be mentally ill.

Even the most cursory examination of the field of child psychiatry reveals the fact that the diagnosis "psychosis" as applied to a childhood behavioral deviation is an ill defined entity, subject largely to the individual or staff interpretation of the moment. Considerable complication arises because of the wide range of "normal" necessitated by the uneven rates of physical, intellectual and emotional progress in the child. Here, too, one would expect to see mental illness in its nascent state rather than in the better defined chronic states as seen in adults. It appears more reasonable to accept such behavioral deviants who have demonstrated an incapacity to adjust themselves satisfactorily in an outside environment. Children with severe behavior disorders, not classifiable as psychotic but demonstrating prolonged and continuous maladjustment, would then be eligible for more protracted treatment than that given during the thirty-day observation period. As long as the emphasis on treatment and rehabilitation to society is stressed, no child will be unjustly incarcerated for an excessive period.

The existing physical facilities, largely located in the medical and surgical building of the Metropolitan State Hospital, consist of two 53-bed wards, the overflow from the boys' ward being housed on the male admission ward, a small solarium utilized for group psychotherapy, two small rooms used as classrooms, a basement playroom, two playgrounds located between the medical and surgical wings, tennis courts, bowling alleys and a gymnasium, the last three being shared with the adult patients. A five-room suite located between the wards contains an examining room, psychologic testing room, doctor's office and two small recreational-therapy rooms.

The most urgent physical need centers around the 50-bed wards, which, originally designed for tractable adult patients, have proved too large to be manageable with 50 patients of great destructive capabilities. Obviously, a situation close to chaos would result if one admitted to the ward the most marked behavioral deviants from the following sources: Fernald State School, New England Home for Little Wanderers, Court cases pending disposition, Monson State Hospital, Lyman School for Boys, Shirley Industrial School and severely regressed and withdrawn children from the community. Only the simplest form of segregation into three groups can be effectively maintained.

These basic groups are: a "deteriorated" group, the members of which need total custodial care, feeding, bathing, toileting, clothing and so forth; a "middle" group, whose members, although able to care for their own immediate physical needs, are in need of constant supervision, training and guidance; and a "self-sufficient" group capable of meeting the demands of hospital environment — that is, of assisting in ward housekeeping, kitchen duties and so forth. Such a system is at present in effect.

Adequate segregation and classification are practically impossible under such circumstances, and treatment is seriously handicapped, since carefully fostered relations between personnel and patients must frequently be strained by administrative expediency.

It is proposed that any specially constructed children's unit be composed of small family-size wards consisting of not more than 10 beds to each ward. On the basis of the present admission rate, which is still increasing, it seems reasonable to expect that approximately fifty such wards would begin to meet the needs expressed by schools, courts and community. An initial nucleus of fifteen such wards is immediately necessary, additional wards being added in a definite building program designed to fit the unit to its average patient load over a period of five to ten years. Durability, safety, ease of maintenance and access, rather than beauty of design, are prime considerations.

The most acute need of this unit is at present for personnel. A subminimal nucleus of interested, enthusiastic and somewhat frustrated persons consists of 2 doctors, a nurse, a social worker, a psychologist, a recreational therapist, and a clerk, with positions for occupational therapist and an additional nurse remaining unfilled. No provision for a separate group of attendants especially trained for work with children exists. The 13 attendants now serving on these two wards are "borrowed" from the attendants allotted the hospital for the care of adult patients.

A more detailed study of the medical needs of such a unit reveals that the physicians occupying

the positions of clinical director and assistant physician work up approximately 400 cases each year (more than 300 inpatients in addition to outpatients, chiefly committed by the courts for appraisals). Study of each inpatient consists of a social history, physical examination, laboratory examination, including an electroencephalogram, and psychiatric examination. In addition, the care of 100 regularly committed patients is administered by these 2 men. No pediatric consultant other than the regular medical and surgical consultants of the hospital is available. No formal outpatient linkage with the community is provided, though if the accent is to be on treatment and resocialization of patients, such an association is vital. Furthermore, the patients passing through and being retained in this unit represent a potential mine of information regarding early and late behavioral deviations. Proper collection and assortment of the mass of data necessary for careful study require a larger force than the bare minimum of 1 psychiatrist to 200 patients.

A proposed minimal medical staff should consist of a director, a senior physician, a consulting pediatrician, 2 assistant physicians, 2 residents in psychiatry and 4 fellows drawn from the fields of psychiatry, pediatrics and anthropology. The need for a director of such a unit is apparent. His duties should consist of co-ordinating the therapeutic and investigational work to maintain maximal efficiency with the personnel at hand. He should be responsible for decisions regarding policy and for the concerted efforts of his staff in an effort to educate the community regarding the needs of the mentally ill child. The efforts of the senior physician should be utilized in the direction of an outpatient department designed to provide the necessary community linkage, follow-up study and continued treatment of patients well enough to function on an outpatient level. Assistant physicians should be available in the ratio of 1 to every 5 10-bed wards, or 1 for each of the present 2 wards to meet the immediate needs of their wards, to carry out individual and group psychotherapy and to work on investigational approaches designed to enhance the understanding and therapy of mentally ill children. Two residents would provide training for a psychiatrist, six months each, on male and female services. An opportunity to provide shorter term training to supplement the other training programs could be met by a fellowship rotation with pediatric-psychiatric facilities maintained by general or pediatric hospitals. Such three-month indoctrination periods would provide a larger group of physicians with a better understanding of the problems confronting the mentally ill child. Judging from the large number of obvious deviations of growth in this group, there seems to be a fertile field for an anthropologist to study at this level.

Since the present two-ward system obtains, the nursing problem has been estimated on this basis. Provision has been made for 2 registered nurses to provide the nursing care for the unit. This allows for coverage of each ward by nurses for forty hours a week, or less than a quarter time coverage by such personnel.

The degeneration of ward administration and treatment during the absence of nurses on the ward is all too painfully apparent, particularly on the boys' ward, where a woman's forebearance and restraining hand are sorely needed to modify the fluctuating disciplinary extremes of male attendants. With twenty-four-hour nursing care, it would not be necessary to transfer the child to the adult medical and surgical wards for treatment of accidents and illnesses not requiring isolation. It is estimated that 8 graduate nurses could provide such coverage for the present two wards. Two supervisors would be necessary to co-ordinate the unit's nursing activities. With such a staff augmented by 6 graduate student nurses obtained from a university nursing school, in addition to 4 student nurses affiliating at this hospital, such procedures as hydrotherapy and insulin therapy could be provided. At present, 4 student nurses on affiliation to the hospital gain valuable experience in mental illness only so long as a registered nurse is on duty. Their training is augmented by a two-hour clinic each week in which an attempt at altering their attitudes from apathy or hostility to acceptance of the problems presented by the patient is made. It is realized that the numbers of nurses suggested above are not available in the present-day shortage of nursing personnel so that immediate interim nursing needs should be aimed at obtaining at least 1 supervisor, 4 registered nurses, 2 graduate students and 4 student nurses to provide minimal coverage.

An additional phase of the nursing problem has to do with the attendant personnel, at present consisting of 13 assorted persons varying from those who are sincerely interested in the welfare of the patients whom they attend to representatives of the economic, social and moral fringe of society, who are attracted only by the possibility of drawing a pay check every Thursday. The present-day labor shortage and low income obtainable in this field place the accent on the latter situation, with the result that this group is highly unstable.

This fact has been demonstrated on several occasions during the process of carrying on group therapy with the patients. Basic insecurities of the attendants are activated, necessitating some group therapy of the attendants themselves. It is unfortunate that the most unstable group is numerically the largest one utilized in patient care and the group constantly in contact with the patients. More complete nursing coverage as suggested, coupled with a practical teaching program carried out by the physicians, would go a long way toward stabilizing such a group.

Social-service coverage at present is provided by the head of the department, a staff worker and 2 students. On the basis of a recent report,[1] the present inpatient and intake load will require a supervisor and 6 staff workers, in addition to the present head of the department. Augmentation of the force dealing with the manifold social problems inherent in mental illness could be accomplished by assignment of a psychiatric-social-work student to each staff worker, the supervisor acting as case consultant for these workers. Valuable insights into patient's problems are at present provided the social-service department by utilization of members of this force in group-therapy situations. Pending the achievement of the goals mentioned above, the head worker should have at least 3 staff members supplemented by three students assigned to the Children's Unit.

In the field of psychologic testing there is available at present the position of a psychologist. It is estimated that 2 psychologists are needed to cope with the present patient traffic.[2, 3] With the addition of 2 student psychologists the necessary "battery" testing of the patients would be accomplished in a fashion designed to accumulate and analyze data in this field as an aid in more accurate classification and treatment.

From the standpoint of education, provision at present is made for the position of a teacher — 1 teacher for 125 of the most disturbed "pupils" in the Commonwealth. There is a singular educational apathy toward the teaching problem posed by the unit, even though it seems apparent that here exists "exceptional" child material that should provide a real proving ground for educational methodology. The transference of results obtained with such children should prove valuable in reorienting the educational approach toward the "fringe" children of the regular and special classroom. To cite a possible example of investigation, the relation of reading disability to early primary behavior disorders should prove a fruitful source of endeavor.

Furthermore, work in this field should be supervised by competent investigators, preferably from a university graduate school of education. It is unlikely that the psychiatrist's life span will be long enough for him to master the fields of medicine, education, sociology and penology in all their details. Hence, it is not reasonable of the Department of Education to step aside on the plea that provision for such a specialized staff should be made through the Department of Mental Health. Although physicians have been exposed to lengthy educations, this in turn does not make them educators, and it seems wiser for these two disciplines to act in concert rather than to attempt to wash their hands of the matter. The least that should be done by the Department of Education is to appoint an advisory board for such a specialized educational problem.

It is estimated that a minimal educational staff should consist of a head teacher and 4 staff members, each of whom could augment his teachings by supervising a graduate student in education for each 100 patients, roughly comprising 50 per cent of patients of normal intelligence, 25 per cent of educable mental deficients and 25 per cent of custodial mental deficients. This estimate is probably inadequate and is subject to revision as better understanding of the educational problems becomes apparent to the psychiatrist.

Aside from these academic aspects, it would be advisable to provide social and vocational training. To a slight degree in small group situations, progress in the social field is at present being made. This entails the use of social workers who eat at least one meal a week with the children. Further attempts at acquiring some proficiency in household duties is afforded in another group setting off the ward. At present, no form of vocational therapy exists owing to the lack of facilities. With the exception of the last named, no new personnel would be necessary, provided a plan for training of ward personnel, including social integration as part of their duties, was made.

Provision is made for an occupational therapist, but at present such a position remains vacant. At least 2 occupational therapists should be assigned to the unit as an initial effort. One of these should be qualified to serve as a co-ordinator of play therapy and psychodramatic technics, and the other should utilize manual-training skills in a small group setting.

At present a recreational therapist is carrying a great deal of the load of play therapy in a group setting (party projects, roller skating, tennis, bowling, sledding and so forth). For the purpose of group control some supplementation of personnel is made available through attendants and student nurses at a resultant sacrifice in efficiency of ward administration. At least 2 counselor assistants, possibly drawn from the field of group work of a school of social work, are needed, particularly from the standpoint of the juvenile delinquent who comes to the unit for a period of observation.

As a supplement to occupational and recreational therapy, community group activities designed to provide a link with society when the child is returned to the community are established, but are as yet functioning poorly. Boy Scout and Girl Scout activities of this sort are attempts at providing such a transition.

In the realm of motion pictures, the productions have been largely recreational, but more recently use has been made of educational films as well. This could be greatly supplemented by membership of the unit in a university educational film library for the purpose of obtaining visual teaching aids.

Although religious education of these children should be neither rigidly directive nor compulsory,

it should be available to the degree that would meet each child's religious need. The Catholic clergy, and to a lesser degree, a Protestant minister, are at present attempting, within the confines of their respective religions, to meet this need. It seems advisable, in view of the lack of moral concept apparent in some patients, that such education should be made available without coercion. An inter-faith advisory board composed of interested clergy could best indicate how this might be carried out in an institutional setting.

From the legal standpoint, such a unit as this becomes increasingly important, directly as the judiciary and law-enforcement agencies recognize the fact that punishment does not always fit the crime. It is not our intent to pamper persons who have clearly demonstrated antisocial tendencies, particularly if the offenses are aggressive and capable of inflicting injury on others, but the apparently prevalent view that "what they need is a good lashing" is not subscribed to, firstly because many of these patients are almost literally driven to their expression of antisocial behavior by such a social attitude so far as can at present be observed, and secondly because the motivation of antisocial behavior should be studied for the valuable insights that will be necessary for its control and prevention. Such insights will not be forthcoming by the use of coercive measures. Particularly is this true in the field of sexual deviation, in which the sensibilities of many people seem to be so sorely offended, judging by the resultant hue and cry when the public is afforded the opportunity of harrying one of these unfortunate persons into a prison.

Provision for the juvenile delinquent in this unit is predicated on the belief that he represents a sufficiently aberrant behavioral pattern to be classified as mentally ill — hence, the need for observation and treatment rather than custodial care. This is not intended as an argument for the emptying of prisons into the mental hospitals, but rather as a plea for extension of psychiatric facilities to the penologic system. A unit such as this can serve largely for classification, aiding in the more complete evaluation of the social offender and as a treatment unit for selected research problems in this field. At present well over 50 per cent of admissions are at the behest of law-enforcement agencies, and it appears that some steps in the correct direction are in the process of being taken by the Youth Service Board.

The clerical needs of the unit cannot in actual practice be met by one clerk, as is provided in the present table of organization, so that at present this position is pooled with the clerical help of the rest of the hospital to obtain an even apportionment of the work to the available clerks. In this fashion, the minimal needs are at present met, with some consequent sacrifice of the clerical efficiency of the rest of the hospital. It appears that at least 3 clerks are necessary to accomplish the present unit record work, particularly in view of the fact that a greater portion of the outpatient work is at present done in penciled notes. With some semblance of adequacy in this department, the records and clerical personnel should then be moved closer to the actual patients, the information previously obtained by the personnel being thus more readily available for the purpose of treatment and research.

The present medical administrative routine is that the superintendent and the assistant superintendent deal with the problems of housing, clothing, feeding and medical supply, attempting to meet the increasing needs of the unit through the regular hospital budget. Since the budget is planned at least a year in advance, the expanding needs of the unit can never be met even minimally. Until a more realistic attitude is taken regarding the expanding budgetary needs, the unit must continue to be society's orphan, begging for its very existence.

From the economic standpoint in the operation of a unit such as this, the experience garnered in the past three years indicates that the Commonwealth has been functioning in a manner similar to that attributed to "Peter at the Dike," stuffing his arm into the leak in the dike to prevent its being washed away completely. The continual destruction and repair necessitated by the large unmanageable wards falls into such a category.

From the standpoint of adequately serving the Commonwealth, it is necessary that a departure from the present available setup be made, preferably along the lines indicated above. It is realized that the initial expenditure would be considerably more than that at present being dribbled away in a year's time. However, over a longer period, it is apparent that a well integrated unit, designed to meet the needs expressed by the Commonwealth, would be more efficient and less costly than the present attempt at patching inadequate facilities.

References

1. Group for the Advancement of Psychiatry. Report No. 2, January, 1948.
2. *Ibid.* Report No. 4, April, 1948.
3. *Ibid.* Report No. 5, April, 1948.

A PUBLIC-HEALTH HEART PROGRAM — FIRST REPORT*

EGON E. KATTWINKEL, M.D.,† VLADO A. GETTING, M.D.,‡ ERNEST M. MORRIS, M.D.,§
HERBERT M. LOMBARD, M.D.,¶ AND LEWIS C. ROBBINS, M.D.‖

BOSTON

IN MAY, 1948, the Massachusetts Medical Society endorsed in principle a pilot study of the public-health aspects of heart disease.[1] The study was to be conducted in Newton under the joint sponsorship of the Newton Health Department, the Massachusetts Department of Public Health and the United States Public Health Service.[2] Its objectives were to determine methods of helping to reduce cardiovascular disease and conserve cardiac function.

A period of a year does not allow sufficient time to draw definite conclusions or submit findings for qualitative or quantitative analysis. However, it does seem fitting to report to the Massachusetts Medical Society concerning the activities that have been initiated and to indicate the direction of the program.

The Newton Heart Demonstration Program, as the pilot study has since become known, is a frankly experimental venture. It rests largely on a belief — held by many cardiologists and public-health authorities — that heart disease constitutes a public-health problem.[3] Mortality statistics show that deaths from diseases of the heart exceed those from any other cause.[4] Many other criteria usually considered before establishing public-health programs remain undetermined when applied to heart disease. For example, how many people in a community are actually ill of heart disease? What is the age at which they are affected? To what extent can heart disease be prevented? How much salvage can be effected for those in whom the disease in one of its forms develops? What aspects of the problem cannot be met except by community measures? And what is the cost of these measures? Finally, what evidence is there that public-health measures will yield results?

Many heart studies will probably be needed to provide answers to these questions. But the United States Public Health Service initiated a local study in an attempt to determine the value of organized community action in helping to meet cardiac needs, and the costs and effectiveness of such action.

The Massachusetts Department of Public Health was asked to co-operate. The Commissioner obtained the assistance of the Committee on Public Health of the Massachusetts Medical Society. Also, the Commissioner appointed a technical advisory committee of leading cardiologists and public-health authorities.

It was believed desirable to conduct the study in a community that employed a full-time, trained medical health officer and furnished basic public-health services. Several communities were surveyed. Newton was selected, and a unit of public-health-service personnel, previously assigned to the Commissioner, was reassigned to the Newton Director of Public Health.

The co-operation and leadership of the Newton medical profession were considered essential. The practicing physician represents the greatest potential source of knowledge of the cardiac problem in the community. With him rests responsibility for diagnosis and treatment of the patient with heart disease. Supplementary services may contribute to the patient's welfare, but they can only be utilized under the supervision of the physician. The key place that the practicing physician naturally occupies was therefore the major consideration in the plans for the heart program.

When the demonstration had become established in the health department, the Director of Public Health and the Medical Officer of the unit requested the assistance of the Newton Medical Club. The President assigned the Committee on Public Health to work with the health department to explore program possibilities and develop preliminary plans. At the request and under the supervision of the Committee, a small survey of the cardiac patients of private physicians was made. The survey, although not statistically significant, yielded information concerning the extent to which existing facilities for cardiac patients were being used, and indicated some of the social and public-health problems of heart disease. On the basis of the findings, a tentative outline of activities for the Heart Demonstration Program was drawn up and presented to the Newton Medical Club, which, in October, 1948, gave its unanimous endorsement.

Medical guidance for the Newton Heart Demonstration Program today lies with a group of 6 physicians known as the Cardiac Program Committee. This committee was appointed by the president of the Medical Staff of the Newton-Wellesley Hospital. Members include 5 internists, 3 with special interest in heart disease, and a pathologist.

*Presented at the annual meeting of the Massachusetts Medical Society, Worcester, May 24, 1949.

†Chairman, Cardiac Program Committee, Newton Heart Demonstration in Program.

‡Commissioner, Massachusetts Department of Public Health.

§Director of public health, Newton Health Department.

¶Chief, Division of Cancer and Other Chronic Diseases, Massachusetts Department of Public Health.

‖Medical officer in charge, Heart Demonstration Programs, United States Public Health Service.

The functions of this committee are to furnish technical leadership and share jointly with the health department in planning the heart program. The Director of Public Health and the Medical Officer of the program meet with the committee once a month or more. The first meeting was held on December 3, 1948.

First Five Steps

After several months of study, a five-point program was recommended for early action. It called, first, for a well informed medical profession, since any services made available to the cardiac patient would be given either by the physician or under his supervision. Secondly, information on the amount and kinds of heart disease occurring in Newton was needed to permit more intelligent program planning. Thirdly, the participation of the public was desired to ensure full use of community resources. Fourthly, a study of the dietary needs of cardiac patients appeared necessary since nutrition touches upon many aspects of prevention and treatment. And, finally, the rehabilitation needs of the patient required investigation if he was to receive full benefit from medical treatment.

Subcommittees were established for the further study and development of the five steps. They included physician education, temporary voluntary reporting, community organization, nutrition and rehabilitation. A sixth subcommittee was set up to consider additional program possibilities.

Subcommittee on Physician Education

The goal of the subcommittee on Physician Education is to contribute to the improvement of diagnosis and treatment of heart patients in Newton. Knowledge of heart disease is advancing rapidly. Every additional development offers new hope and carries with it responsibility for improving the care of the cardiac patient. To help Newton physicians keep abreast of the developments, the Cardiac Program Committee is sponsoring monthly discussions of modern cardiology, known as the Newton Postgraduate Heart Institute. A serious attempt is being made to keep the discussions practical and to foster audience participation. Content is based on interests and needs of local physicians as indicated by a preliminary questionnaire and the expressed wishes of those attending the meetings. The first two sessions included talks on "Practical Aspects of Heart Disease" and "Prevention of Heart Disease." The third meeting will be a discussion entitled "Cardiac Emergencies."

Subcommittee on Temporary Voluntary Reporting

At an early date, the Cardiac Program Committee felt the need for an inventory of the cardiac problem in Newton. The vital statistics of the health department and the hospital records have been studied in an attempt to determine the amount of heart disease in the community and the relative importance of the various types. However, it was believed that information more pertinent to program planning might be obtained if private physicians were to report cardiac cases.

To test the value of such a procedure, for a three-month period the members of the Cardiac Program Committee and the subcommittee are reporting their cardiac cases to the health department. Besides data concerning the disease, the reporting form is designed to indicate the extent of the need for such supplementary services as nutrition and rehabilitation.

Subcommittee on Community Organization

As in all public-health projects, success of the Newton Heart Program will depend to a great extent upon support by the public. An interested, well informed citizenry is not enough. They should actually participate by helping to implement some of the nonmedical aspects of the program.

Plans are being studied for developing an organization representing all interested agencies, clubs and people of Newton. As a first step in this direction, an inservice education program has been carried on for community health and welfare personnel. The Heart Demonstration Program has twice conducted a course in "The Public Health Aspect of Heart Disease" to help these workers become more familiar with cardiac problems. Members of the Cardiac Program Committee, as well as Boston cardiologists and public-health leaders, have appeared as speakers.

Subcommittee on Nutrition

The importance of special diets in the treatment of heart disease[6] suggested possibilities for a community nutrition program. A small study has been started to determine methods of approach and consider the problems involved.

Instruction is being given by the nutritionist of the demonstration unit under the supervision of the attending physician. Patients referred for reduction, low-sodium and rice diets are included.

From a careful appraisal of the results of this study, it is hoped to develop procedures for providing some part of this service through group meetings, public-health nurses and other available community resources.

Subcommittee on Rehabilitation

The Cardiac Program Committee believed that rehabilitation represented one of the most challenging fields for action. Providing diversional activities during the period of convalescence, helping the patient resume his duties in the home and, perhaps most important, assisting him to return to a productive job will contribute to his mental well being and, therefore, to recovery. Certainly, in this phase of the program, widest use will be made of exist-

ing community agencies and of such state agencies as the Department of Vocational Rehabilitation. The Subcommittee on Rehabilitation has recommended the addition of a trained worker to the staff of the demonstration unit to assist in developing the possibilities of this program. Action has been delayed pending his arrival.

The activities undertaken so far are regarded only as a beginning. They represent some of the more obvious needs that must be met to improve the status of the cardiac and the potential cardiac patient. Frankly experimental, they may be changed and adjusted with time and experience.

Future Plans for the Program

Additional problems of cardiac patients are being studied. Programs for prevention, for medical salvage and for case finding are under consideration.

Prevention

Prevention offers the greatest hope. By prevention we mean measures taken to delay heart disease and prevent complications. The Cardiac Program Committee is especially concerned with the need for a weight-control program, prophylaxis of subacute bacterial endocarditis and prophylaxis of rheumatic fever.

Weight Control

Obesity after middle age shortens life expectancy.[6] The Subcommittee on Nutrition is concerned with the part excessive weight plays in the causation of heart disease, and has given a weight-control program a high priority in its plans. However, the Subcommittee has a profound respect for the difficulties of achieving results by public-health methods. The problem is threefold: the prevention of obesity, reduction of those who are overweight and maintenance of ideal weight after reduction. The problem of weight control is almost as difficult as that of keeping an alcoholic patient sober. In fact, the technics of Alcoholics Anonymous are being studied to determine if any are applicable to control of obesity.

Since there are many dangers of obesity and the person seeking to lose weight may be sick, medical supervision will be an important part of a weight-control program.

Subacute Bacterial Endocarditis

Although subacute bacterial endocarditis accounts for a relatively small percentage of cardiac cases, its importance from a public-health standpoint is enhanced now that it can be successfully treated and apparently even prevented.[7] Prevention often depends on the use of prophylactic drugs for all patients with valvular and congenital heart disease undergoing any oral operative procedure and even dental prophylaxis. The Cardiac Program Committee and the Newton Dental Society are therefore planning a co-operative study of the problem. A joint committee has been established to recommend methods by which physicians and dentists of Newton can help prevent subacute bacterial endocarditis.

Rheumatic Fever

Prevention of recurrences of rheumatic fever during the months of hemolytic-streptococcus infection has been placed on the agenda for future study. The Committee plans to determine the extent to which prophylaxis of rheumatic fever is used and would also like to determine to what extent school physicians are aiding in case finding of rheumatic fever. It is hoped that, in attempts to make preventive measures available, not only encouragement but also active support can be given to public agencies and private physicians responsible for children who have had rheumatic fever.[8]

Medical Salvage

Our future program must also consider facilities in the community for meeting unsolved problems in diagnosis and treatment. The committee hopes to help develop and extend resources that can aid the physician in diagnosis and treatment. These include, among others, the cardiac clinic and agencies doing public-health nursing and medical social work.

Cardiac clinic. The cardiac clinic, operated by the outpatient department of the hospital, can be one of the most effective aids of a community heart program. Standards for cardiac clinics have been developed by the New York Heart Association and adopted by the American Heart Association. It is the belief of the association that the cardiac clinic should serve as a center for physician education, and as a clinic for the diagnosis and treatment of indigent persons. The committee hopes to help develop and strengthen the local cardiac clinic to carry out the functions recommended by the American Heart Association.

Public-health nursing. As the activities of the heart program become more numerous, there will be greater dependence upon the work of the public-health nurse. She can play a significant role by rendering bedside nursing care in the home; by referring potential cardiac cases for diagnosis; by interpreting, at the physician's request, diagnosis and treatment; by following lapsed cases for referral back to physicians or clinic; and by directing patients to community agencies for needed services.

Two nurses, with special training in heart disease, have been included in the demonstration unit. They will help the general staff nurses of the health department and the District Nursing Association to develop an awareness of the cardiac problem.

Medical social work. Medical social activities of the hospital, clinic or welfare agency, carried on

under the advice and guidance of physicians, can be of help to cardiac patients in every stage of their illness. The availability of case-work services to patient and family may help to eliminate many of the hazards of long-term illness. Such a service will be encouraged as the Newton Heart Program begins to develop its activities further.

Case Finding

Since there is a growing optimism about the results to be obtained through early treatment of heart disease, one of the chief concerns of the Cardiac Program Committee is to get possible cardiac patients to their physicians for early diagnosis. One answer, of course, is to encourage periodic physical examinations by physicians, and this will be done. But it is often difficult to persuade people to see their physicians so long as they are well, and many physicians find that the time available for periodic examination of healthy people is limited by the demands of those who are ill.

Solution of the problem may be found in a screening method that will permit the examination of well people and the referral of suspected cases to their private physicians. Possibilities are being studied by a subcommittee.

Individuals vary in their likelihood for developing heart disease. It has been shown[9] that, when neither parent has hypertension, only 3 per cent of the offspring of such parents were found to be hypertensive. However, when both parents were so affected, 45 per cent of the offspring were found with hypertension. There are similar leads in rheumatic heart disease and coronary-artery disease.

Perhaps the people who are most likely to develop heart disease should be shown that they require more frequent checkups from their physicians. We are studying the possibility of devising a chart to show each person the extent of his heart hazards. In this way, our limited resources for case finding may be directed where they are most needed.

Many of the plans of the Newton Heart Program are based upon recent developments in the field of cardiology. It can safely be said that a program of this sort is possible today only because of these new developments. However, many more measures are needed before a significant reduction in heart disease in the productive ages can be achieved. We look to the research field to provide us with the tools.

If the medical and public-health professions have a program in operation that can effectively apply preventive and salvage measures as they are unearthed, the time lag between laboratory discoveries and protection and healing can be reduced.

Summary

An interim report of the Newton Heart Demonstration Program is presented.

The aims of this program are: to analyze the extent of the heart-disease problem in a local community; to analyze the present unsatisfied needs of the potential and actual heart patient in the community; to evaluate the possible role of public-health and other local agencies in meeting these needs; to obtain total physician participation in the program and encourage ever-increasing improvement in the quality of medical care; to help develop a permanent all-out effort against the No. 1 killer of Americans.

A review of the efforts to date is presented.

References

1. Massachusetts Medical Society. Proceedings of Council. *New Eng. J. Med.* **239**:130-145, 1948.
2. Massachusetts Department of Public Health. Study of heart disease in Massachusetts. *New Eng. J. Med.* **239**:31, 1948.
3. White, P. D. *Heart Disease.* Third edition. 1025 pp. New York: Macmillan Co., 1944. P. 249.
4. Moriyama, I. M., and Gover, M. Statistical studies of heart diseases. I. Heart diseases and allied causes of death in relation to age changes in population. *Pub. Health Rep.* **63**:537-545, 1948.
5. Marvin, H. M. Recent advances in field of cardiovascular disease. *Bull. New York Acad. Med.* **24**:720-742, 1948.
6. Dublin, L. I. Influence of weight on certain causes of death. *Human Biol.* **2**:159-184, 1930.
7. Sprague, H. B. Prevention of heart disease and disability. *Tr. & Stud. Coll. Physicians of Philadelphia* **16**:57-66, 1948.
8. Rutstein, D. Rheumatic fever community program: its value in epidemiological study of rheumatic fever. *Am. J. Pub. Health* **38**: 1082-1084, 1948.
9. Ayman, D. Heredity in arteriolar (essential) hypertension: clinical study of blood pressure of 1,524 members of 277 families. *Arch. Int. Med.* **53**:792-802, 1934.

THE RELATION OF CAVITY TO THE DEVELOPMENT OF STREPTOMYCIN-RESISTANT TUBERCLE BACILLI IN PULMONARY TUBERCULOSIS*

ROGER S. MITCHELL, M.D.†

TRUDEAU, NEW YORK

IT IS increasingly apparent that the usefulness of streptomycin therapy in pulmonary tuberculosis is seriously limited by the frequent and often early appearance of tubercle bacilli that are resistant‡ to the drug. The development of this resistance in vitro has been observed to coincide with loss of effectiveness of the drug in vivo.[1-4]

The incidence of streptomycin resistance has been found to increase with the number of days that treatment is given.[1, 3, 5-7] It is believed, in addition, that resistant strains appear earlier and more frequently in patients with severe constitutional symptoms and in those with extensive pulmonary involvement.[4, 5] On the other hand, the development of resistance apparently bears no relation either to the size of the daily dose of the drug or to the frequency of its administration during the day.[6]

That the development of streptomycin resistance may be a serious complication is made painfully clear to the clinician who no longer has available its remarkably beneficial therapeutic effect for coincident use in resectional surgery, or for the treatment of a serious, acute pneumonic spread of disease.

The temptation to use the drug in chronic pulmonary tuberculosis, however, remains strong. This is not only because of the unpredictable and striking benefit occasionally seen but also because the tubercle bacilli of a small number of patients unaccountably fail to develop resistance even if the patients are treated for four months or more.

This study was originally suggested by the finding of a considerably lower incidence of streptomycin resistance in patients at Trudeau Sanatorium (Table 1) than in patients being treated elsewhere.[5] The difference was made more significant by the fact that the same criteria and methods for determining streptomycin resistance[7] were used in the two series. It was further noted that streptomycin-resistant tubercle bacilli were only rarely recovered from patients who showed no roentgenographic evidence of pulmonary cavity before streptomycin treatment.

This report is a critical analysis of these data in an effort to discover whether a relation exists between cavity and the development of streptomycin resistance.

MATERIALS AND METHODS

The material for this study consists of all the 117 patients§ treated with streptomycin¶ between November, 1946, and December, 1948, from whom adequate sputum specimens|| were obtained during and after completion of streptomycin therapy. In 6 patients a second course of streptomycin given from six to eighteen months after the first course was arbitrarily considered a separate case, making 123 cases in all. The two courses given to each of these 6 patients were considered individually regarding the duration of therapy. There were only 116 cases studied, since 7 were excluded from analysis because of certain indications for use of the drug, as follows: during and after pneumonectomy, 1; tuberculous bronchiectasis, 3; and tuberculous empyema, 3.

The indications for streptomycin in the 116 cases studied were progressive pulmonary tuberculosis, 98; endobronchial tuberculosis without cavity, 14; tuberculous laryngitis, 2; and intestinal tuberculosis, 2.

All patients had active pulmonary tuberculosis, and the sputum in all 116 cases was positive before therapy. Planigrams were widely used to determine the presence and extent of cavity. Treatment of 16 cases was begun before admission to the sanatorium. In each of the other 100 cases in which treatment was initiated at the sanatorium or at Saranac Lake, sputum cultures obtained before therapy revealed strains of tubercle bacilli that were sensitive to streptomycin. Very small numbers of tubercle bacilli, natively resistant to low dilutions of streptomycin before treatment, are disregarded for the purposes of this study.

The daily dose of streptomycin in this series varied from 0.5 to 2.0 gm. per day, but was usually 1 gm. per day. The drug was given in two daily intramuscular injections at twelve-hour intervals in almost every case.

The method of sputum concentration, culture and inoculation of mediums containing varying dilu-

*From the Trudeau Sanatorium and the Edward L. Trudeau Foundation.

†Associate medical director, Trudeau Sanatorium.

‡The terms "resistance" and "streptomycin-resistant tubercle bacilli" in this report refer to organisms whose growth *is not* inhibited by 10 microgm. of streptomycin or more per cubic centimeter of Tween-Albumin medium. The terms "sensitive" and "streptomycin-sensitive tubercle bacilli" refer to organisms whose growth *is* inhibited by 10 microgm. of streptomycin or less per cubic centimeter of Tween-Albumin medium.

§I am indebted to Drs. J. N. Hayes and H. F. Parry, of Saranac Lake, New York, for permission to use clinical material on 10 of these patients who were treated with streptomycin obtained from Trudeau Sanatorium.

¶Most of the streptomycin used at Trudeau Sanatorium and in the 10 patients at Saranac Lake was obtained through a grant from the American Trudeau Society.

||Fifty-hour sputum concentrates were obtained at weekly intervals during therapy and at monthly intervals thereafter; gastric washings were obtained if possible when no sputum was obtainable and when sputum cultures had become negative.

tions of streptomycin used in these cases has been reported in detail elsewhere.[7*]

Results

Table 1 summarizes the incidence of drug resistance that developed in the 100 cases found positive by sputum culture at some time after completion of streptomycin therapy. The number of cases in which resistant organisms for each of the various durations of therapy developed is shown; the numbers in each group are too small to justify the use of percentages.

In Table 2 the incidence of streptomycin resistance in 3 classes of patients is recorded.

When *cavity was present before therapy and no satisfactory† collapse measure was applied coincidentally*, streptomycin resistance was found in 20 (40 per cent) of 51 cases with positive cultures at the end of treatment. Nine of these 20 showed organisms resistant to 1000 microgm. of streptomycin per cubic centimeter of medium.

When *no cavity was present before therapy*, drug resistance had developed in 3 (11 per cent) of 29 cases with positive cultures at the end of treatment. In 2 of these 3, areas of large, uniform, heavy density on the roentgenogram, which were present before therapy and were presumably due to caseous foci ("filled-in" or "potential" cavities), later discharged their contents and appeared on the roentgenogram as cavities. The third patient was quite ill with extensive chronic endobronchial disease.‡

When *cavity was present* and *satisfactory collapse§ therapy had been initiated just prior to drug therapy*, drug resistance had developed in 2 (10 per cent) of 20 cases with positive cultures at the end of treatment.

The highest degree of resistance attained by any of the 5 cases showing resistance in the last two groups was to 60 microgm. of drug per cubic centimeter of medium.

It is of interest that in 14 cases treated primarily for endobronchial disease without cavity and having positive cultures at the end of therapy, drug resistance occurred in only 1 (7.3 per cent). The mean duration of streptomycin therapy in these 14 cases was two and seven-tenths months.

The significance of the notable differences in incidence of resistance in the three groups is open to question, since there was not only a wide variation in duration of therapy in individual cases (Table 1) but also a moderate difference in the mean durations of therapy (Table 2).

The relation of incidence of resistance to duration of therapy in pulmonary tuberculosis has been de-

Table 1. *Development of Streptomycin-Resistant Tubercle Bacilli in 116 Cases at Trudeau Sanatorium.*

Duration of Treatment*	No. of Cases Treated	Negative Cultures after Completion of Therapy	Positive Cultures after Completion of Therapy		
			Total	Sensitive	Resistant
mo.					
1	6	0	6	4	2
1½	46	6	40	35	5
2	41	3	38	24	14
3	11	2	9	6	3
4	9	5	4	4	0
More than 4	3	0	3	2	1
Totals	116	16	100	75	25

*Approximate.

Table 2. *Relation of the Presence or Absence of Pulmonary Cavity before Therapy to the Incidence of Development of Resistance after Streptomycin.*

Cavity Status just before Streptomycin Therapy	Total Cases	Mean Duration of Therapy	Negative Cultures after Completion of Therapy	Positive Cultures after Completion of Therapy		
				Total	Sensitive	Resistant
		mo.				
Cavity present; no collapse	55	2.1	4	51	31	20 (40%)
No cavity	36	2.4	7	29	26	3 (11%)
Cavity present; coincident collapse	25	1.9	5	20	18	2 (10%)
Totals	116		16	100	75	25 (25%)
Average		2.1				

*All laboratory studies on these patients were performed at the Trudeau Laboratory under the direction of William Steenken, Jr., and Emanuel Wolinsky, M.D., to whom I am indebted for assistance and for the use of these data.

†Unsatisfactory pneumoperitoneum and pneumothorax were abandoned in 2 cases during streptomycin therapy; 1 pneumoperitoneum was continued for purely psychologic reasons but because of poor collapse of the lungs was classed as no collapse.

‡Resistant organisms were also recovered from 2 out of the 3 cases of old empyema not included in this study.

§Satisfactory" collapse measures used were as follows: thoracoplasty, 12 cases; pneumothorax, 3 cases; pneumoperitoneum, 7 cases; and pneumoperitoneum with phreniclasis, 3 cases.

termined by several investigators. The Veterans Administration has reported the largest experience so far.[6] Only an insignificant difference was found in the incidence of resistance in patients treated for one hundred and twenty days with 0.5, 1.0, 1.8 or 2.0 gm. per day. Table 3 summarizes their findings in 1030 patients so treated. The incidence of drug resistance in 46 patients treated at the Veterans Administration Hospital in Sunmount, New York, and determined at the Trudeau Laboratory[7] rather closely paralleled these findings. The observations of others have been similar.[3-5]

Each case in the three groups of Table 2 was then assigned an individual chance of developing resistance, on the basis of the percentages in Table 3; for example, resistance is predicted in 24 per cent of those receiving treatment for one month and is

TABLE 3. *Relation of Duration of Daily Streptomycin Treatment (0.5 to 2.0 gm.) to the Incidence of Development of Drug Resistance.**

DURATION OF DAILY STREPTOMYCIN THERAPY	POSITIVE CULTURES SHOWING RESISTANT BACILLI
mo.	%
1	24
1½	36
2	50
3	64
4	72
More than 4	85

*Data from Veterans Administration Hospital reports.

therefore predicted in 24 out of 100, 0.24 out of 1, 0.48 out of 2 and so forth. The decimal numbers of cases of resistance predicted in each group were totaled, divided by the number in the group and then converted from a decimal back to a percentage. The chance of resistance predicted in this way on the basis of duration of therapy was found to be approximately the same for each group — 48, 49 and 42 per cent, respectively. Therefore, the difference in the actual incidences observed — 40 per cent in the first group, 11 per cent in the second and 10 per cent in the third — is considered to have a significance not materially influenced by variations in duration of therapy.

The size of cavity present before therapy also bore a numerical relation to the incidence of development of resistance in this series. Cavity was measured roughly as the total average roentgenographic diameter of all cavities in both lungs. Of 55 patients with cavity before therapy, 51 still had positive cultures after therapy. Resistance developed in 12 per cent of 8 cases with cavities of 1 cm. or less, in 33 per cent of 27 cases with cavities of 1.5 to 3 cm. and in 63 per cent of 16 cases with cavitation of 3.5 cm. or more. The mean duration of therapy varied from two and one-tenth to two and two-tenths months in these three groups.

There were 45 cases in which cavities failed to disappear during streptomycin treatment. The tubercle bacilli recovered in 24 of these remained drug sensitive; those in the other 21 developed resistance. Although the cases developing resistance tended to have had more extensive cavitation and more severe constitutional symptoms than those retaining sensitivity, it must be emphasized that there were certain notable exceptions.

DISCUSSION

These findings are in accord with the observations of Howlett and O'Connor,[8] who reported that streptomycin resistance developed in only 1 of 15 patients treated for a chronic disseminated nodular type of pulmonary tuberculosis. Further experience to date[9] supports their view that "resistance occurs more commonly in patients with frank caseation or persistent cavity."

The mechanism of streptomycin resistance is not clear. The observations in this series and those of Howlett and O'Connor suggest that the amount of caseation may have an important bearing on the phenomenon. Resistance is theoretically more likely to develop when bacilli are exposed to low concentrations of the drug. Such a low concentration could be due either to the impaired blood supply in caseous tissue or to the presence of excessive numbers of bacilli, or to both.

Streptomycin-resistant tubercle bacilli have been recovered after treatment in some cases of miliary tuberculosis[6, 10] and tuberculous meningitis[10, 11] in which there was no demonstrable cavitation. In these cases, however, there was usually pathological evidence of a grossly caseous focus near a blood vessel, which had presumably given rise to the dissemination.

Both sensitive and resistant organisms have been recovered at autopsy from different parts of the body and even from different foci in one lung.[12] There may therefore be justifiable doubt that the tubercle bacilli isolated from a patient at any one time are truly representative of all the organisms infecting the host. In this connection, it is also possible that collapse traps secretions containing tubercle bacilli of a state of sensitivity or resistance differing from those contained in material reaching the laboratory from other parts of the lung.

When sputum cultures become repeatedly negative before termination of drug therapy, the in vitro reaction to streptomycin of the tubercle bacilli still within the body is also unknown. Streptomycin-resistant tubercle bacilli have occasionally been recovered for the first time from cultures again found positive some months after turning negative.[12] When cultures of the collected material had become repeatedly negative in 16 cases of this series, there was a coincident clinical arrest of the disease. In addition, all positive cultures obtained before sputum conversion in these 16 cases revealed sensitive organisms.

The exact level of streptomycin resistance at which a serious interference with the clinical effectiveness of the drug occurs, is still not clearly established. There is no longer much doubt, however, that in vitro resistance to streptomycin is to be avoided at all costs, if possible. Nevertheless, at times it may be poor judgment to fail to use the drug because of this fear, when there is indication for the drug and a reasonable chance of lasting benefit. This will be true without reservation when the clinician or bacteriologist is able to select the cases in which drug resistance is most unlikely to develop. This study suggests that careful selection of cases for drug therapy may significantly reduce the risk of drug resistance in chronic pulmonary tuberculosis.

Perhaps a more important, though less well documented, observation is the use of collapse measures coincident with streptomycin therapy to reduce the risk of drug resistance. Others have already suggested that streptomycin be used to prepare the patient for collapse therapy.[13, 14] In certain situations, especially in the treatment of acute pneumonic or rapidly progressing lesions, this approach appears sound in spite of the risk of development of resistance. When pneumothorax is planned and tuberculosis of the smaller bronchi is suspected, or when bronchoscopy is not available in a suspicious case, a two-week or three-week course of streptomycin before collapse may reduce pneumothorax complications.

If the experience of others confirms the findings of this study, however, it appears logical to withhold streptomycin, whenever possible, until collapse is well established and is having a satisfactory relaxing effect on the cavity-bearing lung. This course is sound when one considers how long it often takes to establish a suitable collapse, and how quickly drug resistance sometimes supervenes. Pneumothorax may lead to one or more thoracoscopies; pneumoperitoneum may require the addition of phreniclasis or vice versa; more stages of thoracoplasty may be required than originally planned; and, finally, two or more different collapse measures may have to be tried because of mechanical failure of the measure first chosen. If streptomycin is given first or coincident with the beginning of the first collapse measure employed, the usual forty-two-day to sixty-day course of the drug may well be completed and the bacilli may have become resistant before collapse is mechanically satisfactory.

With increasing knowledge of the advantages and limitations of both streptomycin and collapse in chronic cavitary pulmonary tuberculosis, it is no longer always rational to try each method separately. In the light of these observations, coincident utilization of the mechanical effects of collapse and the immunologic benefits of streptomycin should be seriously considered.

Summary

In a series of 116 patients treated with streptomycin at Trudeau Sanatorium positive sputum or gastric cultures were obtained from 100 at some time after therapy was completed. In these 100 cases in vitro resistance to the drug developed as follows: in 40 per cent of 51 with pretreatment roentgenographic evidence of cavity and no coincident collapse; in 11 per cent of 29 without cavity before therapy; and in 10 per cent of 20 with cavity before therapy but with a coincident satisfactory collapse measure.

The possible explanation and clinical significance of these observations are discussed.

References

1. Barnwell, J. B., Bunn, P. A., and Walker, A. M. Effect of streptomycin upon pulmonary tuberculosis: preliminary report of cooperative study of 223 patients by Army, Navy and Veterans Administration. *Am. Rev. Tuberc.* **56**:485-507, 1947.
2. D'Esopo, N. D. Unpublished data.
3. Council on Pharmacy and Chemistry. Streptomycin in treatment of tuberculosis: current status. *J. A. M. A.* **138**:584-593, 1948.
4. Medical Research Council. Streptomycin treatment of pulmonary tuberculosis. *Brit. M. J.* **2**:769-782, 1948.
5. D'Esopo, N. D., and Steinhaus, J. E. Streptomycin therapy: with special reference to pulmonary tuberculosis. *Am. Rev. Tuberc.* **56**: 589-605, 1947.
6. Minutes of the Sixth Streptomycin Conference of the Veterans Administration, St. Paul, Minnesota, October, 1948.
7. Bernstein, S., D'Esopo, N. D., and Steenken, W., Jr. Streptomycin resistant tubercle bacilli: incidence in patients treated with streptomycin. *Am. Rev. Tuberc.* **58**:344-352, 1948.
8. Howlett, K. S., Jr., and O'Connor, J. B. Treatment of tuberculosis with streptomycin: response of certain subacute and chronic types. *Am. Rev. Tuberc.* **58**:139-172, 1948.
9. *Idem.* Unpublished data.
10. McDermott, W., Muschenheim, C., Hadley, S. J., Bunn, P. A., and Gorman, R. V. Streptomycin in treatment of tuberculosis in humans. I. Meningitis and generalized hematogenous tuberculosis. *Ann. Int. Med.* **27**:769-822, 1947.
11. Medical Research Council. Streptomycin treatment of tuberculous meningitis. *Lancet* **1**:582-596, 1948.
12. Steenken, W., Jr. Unpublished data.
13. Levine, E. R., Klein, W. S., and Froman, A. Streptomycin as adjunct in treatment of acute pulmonary tuberculosis. *J. A. M. A.* **138**: 808-813, 1948.
14. Steele, J. D., Jr., and Murphy, T. R. Streptomycin in preparation for collapse therapy. *Am. Rev. Tuberc.* **58**:393-401, 1948.

MEDICAL PROGRESS

CHILD HEALTH SERVICES IN MASSACHUSETTS

JAMES MARVIN BATY, M.D.,* AND LENDON SNEDEKER, M.D., M.P.H.†

BOSTON

THE American Academy of Pediatrics has completed a nation-wide study of health services for children. The findings were published by the Commonwealth Fund in April of this year, and have already led to action to improve the health of the nation's children. The study originated in 1944 when the Committee on Post-War Planning reported to the membership of the Academy on the general situation regarding the health of the country's children and recommended that a survey of existing health services be made before any future health program was undertaken. At the same time legislation was pending in Congress that threatened radically to change the nature of medical practice. The study was to ascertain the extent and distribution of present services to children whether provided by professional men in practice, by hospitals and clinics, or by voluntary and official community health agencies.

The Academy study began in North Carolina in the fall of 1945. Other state studies were started in the spring of 1946, following procedures set by the Committee for the Study of Child Health Services, with a central office under the leadership of Dr. John P. Hubbard, the executive director. The results of these studies are now being published in most of the states and recommendations are being made regarding future action, state by state, in the light of local conditions.

This effort is striking evidence of the collective concern of the physicians and dentists of the country for the welfare of children. It is the first time that doctors have pooled their voluntary efforts and inquired into the facilities serving the nation's child population. The survey was made by those directly responsible for rendering health service, and the recommendations are based on facts viewed in the light of a knowledge of local conditions within the states.

In the development of the survey it was left to the initiative of each state chairman to develop an organization in his state, make plans for the distribution and collection of schedules, finance the work and arrange for the reporting of the findings. The central office was responsible for setting the procedures to be followed, for tabulating the data and for returning information to the states for their own use.

The Massachusetts study corroborates and reemphasizes some of the national findings of the Academy. The importance of the general practitioner in caring for children and the uneven distribution of medical services are both apparent. In Massachusetts, as in the country generally, three fourths of the private medical care of children is supplied by general practitioners. They take care of most of the sick children and also, as a group, do most of the well-child supervision.

Massachusetts, in common with most of the New England states, possesses certain characteristics that set it off from the rest of the country. The population is older. Per-capita incomes are high. There are many small and independent agencies serving children, and official health activities are administered by the local city or town rather than by the county.

MASSACHUSETTS STUDY

The Massachusetts Study of Child Health Services was organized in the spring of 1946 and its report, of which this article is a digest, has recently been published by the American Academy of Arts and Sciences.‡

In tabulating data and for comparing sectional differences in health service the Academy study has compiled its information by county and by "metropolitan character of county." This statistical device, which classifies counties according to both population density and proximity to centers of population, is of less use in Massachusetts, where there are only fourteen counties and the population is more uniformly distributed than elsewhere. There are only three "isolated" counties in the Commonwealth: Barnstable, Dukes and Nantucket. Comparatively rural areas in several other counties are obscured (Fig. 1). For this reason Massachusetts data have also been tabulated by health districts, since these seem more adequately to bring out variations in service. Furthermore, they correspond to the present administrative areas of the Massachusetts Department of Public Health (Fig. 2).

Detailed information regarding the collection of data for the Massachusetts study will be found in the complete report to which reference has already been made.

*Professor of pediatrics, Tufts College Medical School; president, Massachusetts Chapter, American Academy of Pediatrics.

†Executive secretary, Massachusetts Study of Child Health Services.

‡American Academy of Arts and Sciences. *Health Services for Massachusetts Children.* Special publication, 1949.

Massachusetts is the twelfth wealthiest state in the Union, with an average annual per capita income of $1289, but in 1946 the Commonwealth ranked twenty-second in maternal mortality and twentieth in infant mortality among the states (Table 1). Boston, its largest city, had an infant mortality one point higher than the national average (34.8 per thousand live births).

Massachusetts has an aging population. A third of the inhabitants of the United States, but only a fourth of those in Massachusetts, are under the age of fifteen years.

The Commonwealth has many fewer children living in rural areas than in the rest of the country. Thirty-seven per cent of those in the United States but only 1.1 per cent of the children in Massachusetts live in "isolated counties."

Responsibility for the maintenance of most official public-health services for children rests with the 351 cities and towns in the Commonwealth. Many of these are small municipalities financially incapable of supporting adequate, modern, full-time health services. Although this multiplicity of governmental units preserves independence and local autonomy, it results in inadequate financing, supervision and integration of health activities.

The findings of the Massachusetts study cannot all be compressed into the confines of this summarized report, but the salient points are briefly outlined, together with selected supporting data.

Total of Medical and Dental Service for Children

Massachusetts ranks third in the country with respect to the total amount of medical service that its children receive. The rate of medical care is exceeded only by that in Nevada and New York.

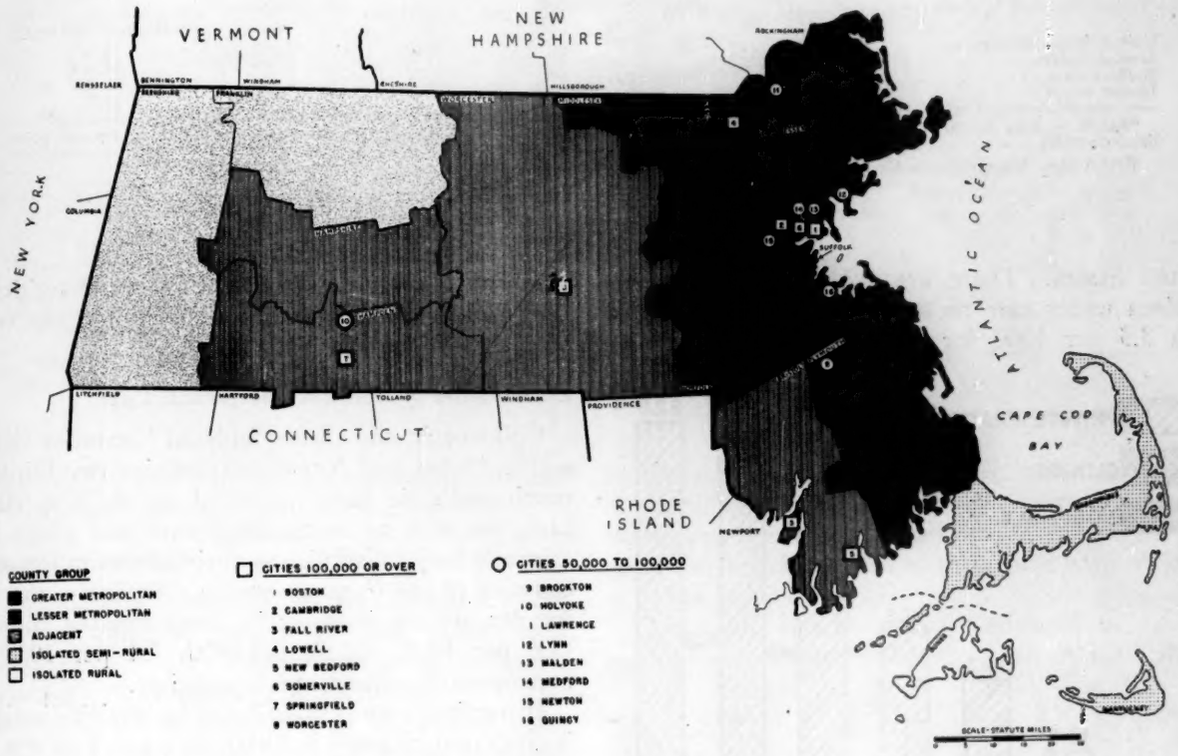

FIGURE 1. *County Groups in Massachusetts.*

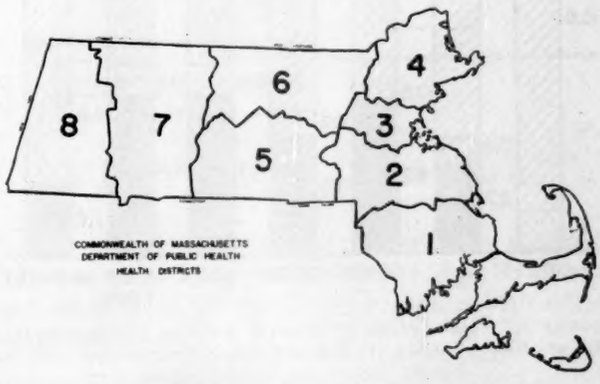

FIGURE 2. *Health Districts in Massachusetts.*

Three fourths of the total consists in visits to children by medical practitioners (Fig. 3). Out of a total of 20.3 children per day per 1000 children under

medical care, 15.1 were visited by physicians in their homes or visited a doctor's office.

There are over twice as many children in Massachusetts under dental care as there are in the whole United States. There are 7.2 children per 1000 children under care on an average day, compared with 3.3 per 1000 for the whole country. Nine tenths of the dental care to children is furnished by dental practitioners, and one tenth by dental clinics. The comparative figures on medical and dental service are shown in Table 2.

TABLE 1. *Population, Income and Mortality of United States, Massachusetts and Selected States.**

SOURCE OF DATA	CHILD POPULATION IN ISOLATED COUNTIES	CHILDREN IN TOTAL POPULATION	PER CAPITA INCOME 1944-46	INFANT MORTALITY IN 1946
	%	%	$	*per thousand live births*
United States average	37	25.0	1,141	33.8
Massachusetts	1	21.8	1,289	31.6
Highest state	100	34.5	1,579	78.2
Lowest state†	8	19.8	559	27.2

*Based on data contained in American Academy of Arts and Sciences, *Health Services for Massachusetts Children.* Special publication, 1949.

†Other than Massachusetts for percentage of children in isolated counties.

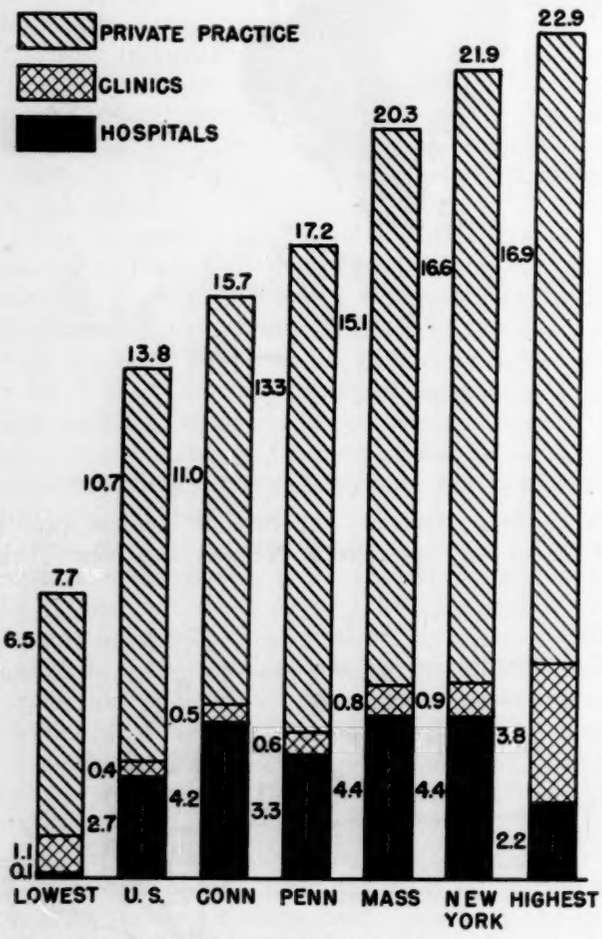

FIGURE 3. *Total Volume of Medical Care for Children on One Day per 1000 Children in Massachusetts: Comparison with the United States and Selected States.*

Proportion of Medical Service for Health Supervision

About 30 per cent of the children under care on an average day are receiving health supervision. Two thirds of this is furnished by the general practitioner. Well-child conferences account for about one tenth of all health supervision.

Distribution of Medical and Dental Care

Children in the three "isolated" counties (Barnstable, Dukes and Nantucket) receive two thirds as much pediatric care, one third as much specialist care, one fifth as much clinic care and about half as much hospital service as their fellows in the other counties of the Commonwealth. Similarly, the rate for dental care is lower in these isolated counties (5.6 per 1000, contrasted with 7.4 per 1000 for metropolitan and adjacent counties).

If medical care is considered by health district it is clear that children in Districts 1 and 5 receive the lowest rates of service (Fig. 4).

Distribution of Physicians and Dentists

Massachusetts ranks second among the states with reference to the number of physicians in private practice. There is 1 physician for every 855 people, and 1 for every 202 children under the age of fifteen. Of all practitioners, 61 per cent are family doctors, 4 per cent are pediatricians, and 35 per cent are specialists in other fields. Ninety per cent of medical practitioners live in cities with populations of 10,000 or more, which contain 83.5 per cent of the inhabitants of the Commonwealth. There are fewer doctors in Districts 1, 2 and 6 in proportion to the child population.

Massachusetts ranks fifth with respect to the number of dental practitioners. There is 1 dentist for every 368 children. Over 90 per cent of dentists live in cities of 10,000 or more. The proportion of dentists to population in District 3 is twice that in Districts 1 and 6.

Contribution of General Practitioner to the Care of Children

On an average day the physicians in Massachusetts made a total of 19,418 visits to children. This

amounted to 4.06 child visits per physician, or 20.1 child visits per 1000 children per day. General practitioners made three quarters of these visits.

Care to children constitutes almost a third of the practice of the general practitioner. Of 18,984 visits to patients of all ages, 30.8 per cent were made to children under the age of fifteen.

About a third of all general practitioners do major surgical operations on their child patients, half do tonsillectomies, and four fifths are consulted for advice regarding problems in infant feeding.

Ratio of Pediatricians to General Practitioners

Massachusetts ranks fifth among the states in the number of children per pediatrician. There is 1 pediatrician for every 5360 children, as compared with one for 10,299 in the United States.

Pediatricians are younger than the run of practitioners. The median age for pediatricians in Massachusetts is forty-five years. Sixty-six per cent of general practitioners and 76 per cent of pediatricians are under the age of fifty-five years.

Ninety-seven per cent of the 180 pediatricians registered by the Massachusetts Study were located in cities of over 10,000 population.

Place of Health Supervision in Medical Service to Children

Health supervision constitutes nearly a third of the medical service given to children. In addition to furnishing health service in private practice, doctors participate in various types of community health service.

For the whole United States 26 per cent of the child care provided by the general practitioner is for health supervision. Over twice this amount is furnished by pediatricians (54 per cent). In Massachusetts general practitioners devote 33 per cent and pediatricians 62 per cent of their time with children to health service (Fig. 5).

The doctor is also actively engaged in various types of community health services. Of 1259 physicians reporting, 13 per cent had worked in well-child conferences during the month preceding the survey, and about an equal number had worked with school health services.

Hospital Privileges for Care of Children

Hospital privileges for the care of children are restricted for a fifth of practitioners. Nineteen per cent of 1597 physicians reporting said that they were not permitted to care for their child patients in the nearest hospital admitting children.

TABLE 2. *Total Medical and Dental Service for Children in Massachusetts, United States and Selected States.**

SOURCE OF DATA	CHILDREN UNDER MEDICAL CARE *per day per 1000 children*	CHILD VISITS BY PHYSICIANS *per day per 1000 children*	CHILDREN UNDER DENTAL CARE *per day per 1000 children*	PRE-SCHOOL CHILDREN UNDER HEALTH SUPERVISION *per day per 1000 children*
United States	13.8	13.5	3.3	5.5
Massachusetts	20.3	20.1	7.2	9.9
Highest state	22.9	21.8	7.2	10.7
Lowest state	7.7	7.8	0.9	1.9
National ranking of Massachusetts	3.0	3.0	1.0	2.0

*Based on data contained in American Academy of Arts and Sciences, *Health Services for Massachusetts Children.* Special publication, 1949.

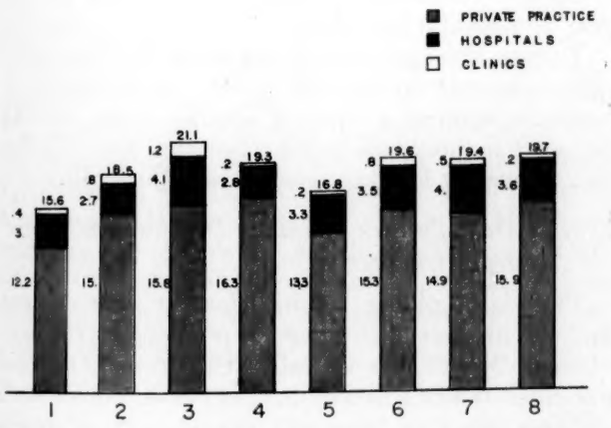

FIGURE 4. *Rates for Total Medical Service by Health District in Massachusetts, Expressed as Children under Care per Day per 1000 Children.*

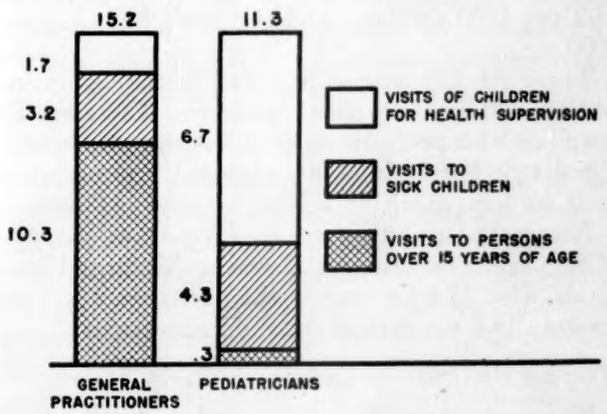

FIGURE 5. *Proportion of Practice Devoted to the Care of Well and Sick Children by General Practitioners and Pediatricians in Massachusetts (Average Number of Visits per Day).*

Inadequacies in Hospital and Pediatric Training

The considerable proportion of practice concerned with the medical problems of children and degree of responsibility assumed by the practitioner for the surgical problems of childhood calls for adequate pediatric training. Although the preparation of physicians for practice is continually improving, it is noteworthy that of 1607 general practitioners in Massachusetts 7.2 per cent reported that they had had no hospital training whatever. A total of 2.5 per cent had had less than a year of training. Over a third had had less than a month's hospital work in pediatrics before entering practice, and slightly less than a third had had no postgraduate training in pediatrics. Doctors who had had more than a year of hospital training were making 85 per cent of the visits to children.

Deficiencies in the Training of Dental Practitioners

Only half the 1735 dentists reporting had had any training in children's dentistry. Training in the care of children was more frequently reported by older practitioners.

Hospital Facilities for Children in the State as a Whole

The Commonwealth is fifth in number of hospital beds, third in number of children's beds and ninth in the number of child admissions per 1000 children. One twentieth of the 43,084 general-hospital beds for children in the United States are in Massachusetts. Total hospital beds in Massachusetts number 18.2 per 1000 children, and children's beds 2.2 per 1000.

There are 151 general hospitals in the Commonwealth, 140 of which admit children. There are 72 hospitals with pediatric units of 5 or more beds, and 3 pediatric hospitals. More than half the pediatric beds are located within a 25-mile radius of Boston.

Nonprofit hospitals provide nearly three quarters of the available beds for children. Municipal hospitals, with 23.4 per cent of the pediatric beds, care for only 14.2 per cent of the child admissions.

Hospital Facilities for Children in Rural Areas

There are 11.6 general-hospital beds per 1000 children in the "isolated" counties (Barnstable, Dukes and Nantucket), and 18.3 per 1000 in the rest of the State. There are only a quarter of the pediatric beds in isolated counties in proportion to the child population that there are in the State as a whole. There are fewer hospital facilities for children in Districts 1, 2 and 4.

Size of Hospital

Most children are admitted to large general hospitals with over 100 beds, especially to those with pediatric units; 73.9 per cent of all child admissions occur in hospitals with more than 100 beds, and 86 per cent in hospitals with pediatric units.

Use of Pediatric Beds

Pediatric beds are not fully utilized. The occupancy rate for pediatric beds in the Commonwealth averages 60 per cent, but rates as low as 45 per cent have been noted for certain hospitals.

Effect of Size and Character of Hospitals on Quality of Care

Hospital facilities for children improve with size, and hospitals with pediatric units are more adequately staffed and equipped. Small proprietary hospitals are limited in laboratory facilities and trained personnel for the management of pediatric cases.

Isolation Facilities for Infants and Graduate-Nursing Supervision

Thirty-one per cent of child admissions occur in hospitals with no graduate nurse in charge of the pediatric unit. In 36 per cent infants, other than newborn, are not segregated from older children, and the risk of intercurrent infections is correspondingly greater.

Births in Hospitals

In 1946, 97.2 per cent of the births in Massachusetts occurred in hospitals. The percentage was slightly lower in the isolated counties (89.7) and nonwhite mothers had slightly more births outside hospitals in the same area. The average length of hospital stay for newborn infants was nine and four-tenths days.

Neonatal Infection

Certain conditions in newborn nurseries predispose to neonatal infection.

Twenty-three per cent of the births in Massachusetts hospitals during the report year occurred in hospitals without a separate formula room, and 45 per cent in hospitals lacking isolation facilities for sick infants or for those suspected of being ill.

Care of Mentally Sick, Mentally Deficient and Epileptic Children

Two thirds of the facilities for the convalescent and chronic care of children are reserved for the care of mentally sick, the mentally deficient and epileptic patients. Waiting lists in institutions caring for such children are very long, and the amount of supervision by graduate nurses is far less than that in other institutions caring for the chronically sick.

Care in Medical Clinics

The rate of clinic care of children is high in Massachusetts, being twice that for the United States average. However, clinics account for only 5 per cent of all medical service to children.

Eighty per cent of all the clinics caring for children are in general hospitals of over 100 beds, and more

than half of these have separate pediatric clinics. There is only one hospital outpatient department in the "isolated" counties (Barnstable, Dukes and Nantucket). Clinic facilities are less in Districts 2, 5, 7 and 8. Special pediatric clinics are almost all located in the more urban areas.

Care in Dental Clinics

The rate of dental-clinic care of children is high in Massachusetts, but there is considerable difference in the rates of care in the various health districts.

Children in the neighborhood of Metropolitan Boston (District 3) receive much more care than those in other districts, whether this is expressed in terms of dentist hours, patients, visits or examinations. Official dental agencies care for more children, but provide less service to the individual child.

Distribution of Public-Health Nursing Service

Although Massachusetts ranks fourth among the states in the amount of public-health nursing service to children, there are inequalities in the distribution of service and a need to increase the proportion of nurses who have had specialized training.

Fifty-nine per cent of the cities and towns in the Commonwealth reported that they maintained some form of public-health nursing service. The distribution of nurses in the state is uneven, and the rates for service vary. There are often several nursing agencies in a single city or town without provision for co-ordination of effort. Only a small percentage of nurses have had special training in public health. Of 854 nurses 686, or 80 per cent, had had no formal training in a recognized program of public-health nursing, or had completed less than one academic year.

Character of Medical Service for School Children

Some kind of medical service is almost universally available to the school children of Massachusetts, but there is great variation in the character of that service. Although there are no counties without school health supervision, seven towns fail to report any service. Eighty-eight per cent of the physicians in the public schools are general practitioners. Only 47 of 602 school physicians are pediatricians. Less than half the 552 school nurses reported are employed full time.

Health Supervision for Children of Pre-school Age

Massachusetts ranks second among the states in the amount of health supervision for children of pre-school age. About one tenth of such care is provided by well-child conferences.

The rates of care for well-child conferences (Fig. 6) are not uniform and are lowest in Health Districts 4 and 5. Over half the 276 well-child conferences reported are maintained in whole or in part by official agencies. Children make an average of two and eight-tenths visits per year each. In a few towns conferences are held only twice a year.

General practitioners and pediatricians together provide about four fifths of the medical service at these clinics. Most of them are part-time, paid workers. Five per cent of the general practitioners and 1.3 per cent of the pediatricians serve without compensation.

Service in Well-Child Conferences

There is considerable variation in the kind of service available in well-child conferences. Infants receive more care than older children. Practically all clinics provide nursing service, and medical advice regarding feeding and child management is

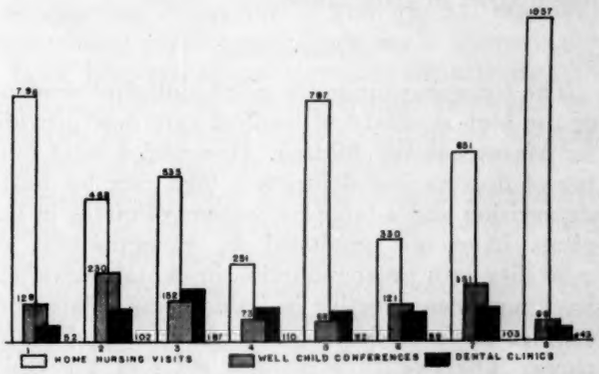

FIGURE 6. *Yearly Rates per 1000 Children for Three Types of Community Health Service in Massachusetts by Health District. Well-child conference visits are expressed per 1000 children under five years of age.*

available at 83 per cent of all sessions. Approximately two thirds of the sessions provide nutrition service, and one fifth psychologic or psychiatric advice when needed.

Immunization in Well-Child Conferences

Well-child conferences are not effective in immunizing children against communicable disease. Only a small percentage of sessions routinely provide immunization. One third immunize against diphtheria, whooping cough and smallpox. In clinics where the number of children immunized is known, slightly less than half the children are vaccinated and about one quarter immunized against diphtheria and whooping cough. The practices followed in various clinics are not uniform and often fail to recognize the need for immunization in the first two years of life, rather than in the pre-school period.

Care of Physically Handicapped Children

Facilities for the care of the physically handicapped are fairly evenly distributed throughout the Commonwealth. A large amount of specialized orthopedic and other care to physically handicapped children is provided in hospitals, especially in the teaching centers of Boston, and is not enumerated by the study. Clinics maintained under the Crippled Children's Program limit their services to children

with orthopedic and plastic conditions, and to those with speech defects.

Care of Mentally Handicapped Children

The existing services for mentally handicapped children are too limited. There are 21 mental-hygiene clinics operated by the Massachusetts Department of Mental Health or the city of Boston. There are only 3 independent clinics under voluntary auspices, and 7 voluntary hospitals with special mental-hygiene facilities. All the clinics have complete staff service, which means at least a part-time psychiatrist, a psychologist and a social worker. Nearly two thirds of the clinics have a full-time psychiatrist in attendance.

Discussion

The foregoing summary gives abundant evidence of the high standard of medical care now provided for Massachusetts children. However, a large number of doctors and dentists, a high rate for health supervision and a large percentage of births in hospitals have not produced an exceptionally low mortality or a great reduction in dental decay, and have not been effective in immunizing a large percentage of the children attending well-child conferences. The twelfth wealthiest state in the Union should not stand in twentieth place in infant mortality or twenty-second in maternal death rate. Although it is agreed that such rates are not the only measure of the efficacy of a health program, one does not expect a highly urban state such as Massachusetts to be outstripped by rural states like Nebraska and North Dakota, or by such nearly comparable neighbors as Rhode Island and Connecticut. These mortality rates seem unnecessarily high.

Medical care for children in Massachusetts, as well as in the rest of the United States, is unevenly distributed and least available in rural areas. In view of the small proportion of children living in the isolated counties of Massachusetts, this may not be as significant as in other states, where the problems of distance make it difficult to obtain medical service. However, such inequalities need investigating, and will have to be eliminated before it can be said that all children in the Commonwealth have an equal chance to survive infancy and grow to competent majority.

The general practitioner, who is by far the most important person providing medical service to children, needs more pediatric training, both in medical school and in hospital. In the realm of postgraduate pediatric education, a review of programs sponsored by the Massachusetts Medical Society or by the New England Postgraduate Assembly discloses relatively few papers dealing with the problems of children. This is by no means meant as a reflection on the very considerable program now being carried out by the Society, in co-operation with the Massachusetts Department of Public Health, both at weekly sessions held for two months each year in Boston and at the meetings of its district medical societies.

There is another opportunity for improving the pediatric education of physicians. It was noted that nearly a fifth of physicians lacked hospital privileges in near-by institutions to which their child patients were admitted. With further means developed for including these physicians in the educational activities of these hospitals and with the elimination of substandard medical schools, eventually more doctors should be able to enjoy hospital privileges.

What has been said of physicians is equally true of dental practitioners. The small number of dentists who specialize in children's work or in orthodontia is evidence of the relative lack of interest in the dental problems of early life. With the dentists now available, or in prospect, it is practically impossible to meet present demands for restorative dental work, even if the means could be found to pay for it. It is probably advisable to extend the use of auxiliary dental personnel, but especially to develop effective mass prophylaxis against dental decay.

Hospital facilities for children are unevenly distributed throughout the Commonwealth. Part of this inequality may be compensated for by the transportation of sick children to suitable pediatric centers, but the situation calls for some critical consideration. It is not only a lack of beds but also the manner in which they are utilized and safeguarded that is important. About a third of the hospitals admitting children have no graduate nursing supervision of their pediatric beds. There is evidence that some hospitals lack adequate provision for safeguarding infants, including newborn, against intercurrent infection in the hospital. There is evidence that pediatric beds are not being fully utilized. Construction of new beds for children should probably not be undertaken until it is clear that present use is optimal. These are matters that should be considered and, when necessary, improved through the local action of practitioners interested in the welfare of children. The Division of Hospitals of the Massachusetts Department of Public Health is an important factor in improving hospital standards. It should be sufficiently provided with personnel so that it is able to temper its present regulatory power with a large amount of educational work. More often hospital standards should be based on the collective experience of practicing physicians, and this is well exemplified by the recent report of the Committee on the Fetus and Newborn of the American Academy of Pediatrics.

The prime need in the field of chronic care is to provide more beds for the mentally deficient and epileptic.

Outpatient facilities are fewer in the isolated areas of the Commonwealth. On the other hand the practitioner in the country runs his own outpatient department along with his practice. A relative lack of clinics may be chiefly important in the diagnostic facilities that the average physician cannot provide

in his own office. Modern transportation reduces the necessity for providing a variety of outpatient services, but the poor, who are in greatest need of corrective services, are least able to travel. Programs for the correction of physical defects will continue to be relatively ineffective and unnecessarily expensive as long as diagnostic and corrective services are inconveniently distant from the affected child.

A few general points might be made regarding community health services for children. Well-child conferences cannot be considered really effective until they provide the medically indigent with continuously accessible facilities for examination, immunization and medical advice. An average of two and eight-tenths visits per year is not enough to constitute regular health supervision. The average well-child conference is not effective in immunizing children against the important communicable diseases. Although these conferences should not be the only agencies providing immunization, they should be more effective with the clientele they serve. At present the diversity of health agencies, their physical separation and the resultant partition of medical service discourage the medically indigent from seeking attention. It would be advantageous to centralize health services more often and to locate them, where possible, in or near the local hospital.

If towns wish to maintain their own services, there should be some provision for unification and supervision of their work. One or more adequately paid pediatric consultants could do much to improve the present situation. The solution of many child health problems would be facilitated if agencies were working more often in conjunction with local health units of adequate size, and employing well trained, full-time personnel.

Recommendations

In consideration of the large proportion of medical practice that is concerned with children, medical schools should devote more attention to maternal and child health in their curriculums, placing emphasis on preventive technics applicable in private practice.

In addition to their present educational activities, the Massachusetts Medical Society, the Massachusetts Chapter of the American Academy of Pediatrics and the New England Pediatric Society should sponsor programs for training in maternal and child health for all professional persons caring for children, with particular emphasis upon those preparing for general practice.

Dental schools should likewise stress preventive dentistry and its application to childhood in their curriculums. Research should include an energetic inquiry into methods of dental prophylaxis. Where dental personnel is inadequate greater use of auxiliary personnel should be considered.

Means should be found for encouraging young physicians to settle in the parts of the Commonwealth where children are now receiving less than the average amount of medical service.

Wherever possible hospital privileges should be extended to physicians who show an active interest in increasing their professional ability by availing themselves of opportunities for postgraduate education.

The present co-operative efforts of the Massachusetts Medical Society and the Massachusetts Department of Public Health to reduce maternal mortality should be intensified. Some investigation of infant deaths should be undertaken. The present system for reporting infant births and deaths, especially those among premature infants, needs improving.

Local hospitals should increase their existing safeguards against cross infection in children's wards and nurseries for newborn infants. Adequate isolation facilities are of major importance.

Construction of new hospital facilities for children should be undertaken only after due study of local needs and the present utilization of existing beds. The limitations of the community hospital in treating the diseases of children and its function as a health center deserve reconsideration.

The Massachusetts Department of Public Health should be enabled to provide pediatric, nursing and other consultants to work on the problem of correlating and improving local health work for children.

Present facilities for the hospital care of children with mental deficiency and convulsive disorders should be increased.

Well-child conferences should increase the frequency of their health supervision and intensify their efforts to detect and follow children with defects. The efficiency of the present immunization program should be improved and present policies should be scrutinized. Opportunities should be increased for the training of doctors conducting well-child conferences.

Dental clinics in the Commonwealth should be increased in areas where present services are below average.

Public-health nursing services should be more adequately supervised and integrated. Under present conditions service is unevenly distributed, and there is too much opportunity for duplication of effort. Standards for the employment and training of public-health nursing personnel need improving.

The medical and dental professions should give support to the recommendations made in the *Report of the Special Commission to Study and Investigate Certain Public Health Matters* (House Document 2100, 1949). Those having special importance are: the development of local full-time health services; improvement in present methods for collecting and transmitting vital statistics; and the provision of adequate standards of employment and remuneration for public-health personnel.

CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

Weekly Clinicopathological Exercises

FOUNDED BY RICHARD C. CABOT

TRACY B. MALLORY, M.D., *Editor*

BENJAMIN CASTLEMAN, M.D., *Associate Editor*

EDITH E. PARRIS, *Assistant Editor*

CASE 35381

PRESENTATION OF CASE

First admission. A forty-one-year-old Italian shoemaker was admitted to the hospital complaining of a cold in the chest.

For ten years before admission the patient had a severe cough, which increased in frequency and severity up to admission. Eight years before entry dyspnea appeared, especially after bouts of coughing. A chest x-ray examination was said to have demonstrated some "bronchial difficulty, but no serious disease." Five years before admission the dyspnea had become so severe that he was forced to take an easier job at which he could sit down. Two years before entry, on the advice of his physician, digitalis was started and maintained up to admission. There had been no weight loss. There was an inconclusive history of one or two slight episodes of ankle edema. He had had night sweats for many years. Orthopnea requiring three pillows at night was present for three years. A cupful of dark-brown, nonfoul-smelling sputum was raised every day. Four days before admission he "caught a cold in his chest" and had two severe chills during which his teeth chattered. The cough increased in severity, and he felt feverish.

He had worked in a steel mill twenty years before admission and was exposed to large amounts of metal dust and fumes but not to silica.

Physical examination showed a well developed man, breathing quickly with an audible wheeze. The heart was slightly enlarged to the left and moderately enlarged to the right. The rhythm was that of a rapid auricular fibrillation, with an apical rate of 130 and a radial pulse rate of 80. Numerous sibilant and musical rales and increased tactile fremitus were present over the right posterior chest. The liver edge extended four or five fingerbreadths below the costal margin and was smooth and tender. The fingers were not noticeably clubbed, but the nails were extremely curved. The temperature was 102°F.

Examination of the blood revealed a white-cell count of 15,000, with 78 per cent neutrophils. The hemoglobin was 17 gm., and the red-cell count 6,700,000. The urine had a specific gravity of 1.022 and gave a +++ test for albumin, and there were occasional red and white blood cells in the sediment. The sputum was rusty and negative for acid-fast organisms. The stools were guaiac negative. The prothrombin time was 23 seconds (control, 18 seconds). The van den Bergh test was 1.2 mg. per 100 cc. direct and 2.0 mg. indirect. The total protein was 7.42 gm. per 100 cc., with an albumin of 3.49 gm. and a globulin of 3.93 gm. (albumin-globulin ratio of 0.89). The cephalin-flocculation test was + in forty-eight hours. The cholesterol was 263 mg., the nonprotein nitrogen 34 mg., and the serum phosphorus 2.8 mg. per 100 cc. The alkaline phosphatase was 3 units. A bromsulfalein test showed 22 per cent retention and 8 per cent retention on separate occasions. An electrocardiogram demonstrated auricular fibrillation, with a ventricular rate of 160. Right-axis deviation was present. The T wave in Lead 1 was flat. The ST segments in Lead 2 and 3 were sagging, and the T waves in Lead CF_2, CF_4 and CF_5 were inverted. The S waves in the precordial leads were of greater voltage than normal. The vital capacity was 1.7 liters. X-ray study of the chest demonstrated an enlarged heart without any characteristic configuration, the ratio being 15.7 to 32.2. There was considerable engorgement of the hilar and pulmonary blood vessels. There was a diffuse, hazy increase of density in the left lower chest, with a small amount of fluid in the left pleural cavity.

Digitalis, small doses of quinidine and intramuscular administration of penicillin had no remarkable therapeutic effect. When aerosol penicillin was given the temperature gradually subsided, and the severity of the cough and sputum production diminished. He was discharged one month after admission.

Final admission (three years later). He was followed regularly in the Out-Patient Department. During the entire interval between admissions therapy included digitalis, ammonium chloride and a low-salt diet. Auricular fibrillation was present at each examination. For the first two years he was able to do light work, although exertional dyspnea and orthopnea were marked. In the year before readmission weakness, cough and exertional dyspnea were so great that he was unable to work, spending much of his time in bed. There was no ankle edema. Two and a half years before re-entry on one examination, with the apex rate at 84 and with the patient in the left lateral recumbent position, the first heart sound was sharp, and a distant, rumbling, mid-diastolic murmur was noted. Chest x-ray examination showed no appreciable change in heart size and configuration, although it was evident that the left auricle was enlarged. The lung fields were clear. At intervals carious teeth were extracted while the patient received penicillin intramuscularly. About three months before readmission he complained of several episodes of bloody sputum and a tender swelling in the left leg. There was no tenderness or swelling at the

time of examination two weeks later, however. Five weeks before entry he was admitted to another hospital and treated with aerosol penicillin. During a four-week period of hospitalization the symptoms increased in severity. At home, during the week prior to readmission to this hospital, ankle swelling appeared, and dyspnea became very marked.

Physical examination showed a well nourished man, who was coughing and dyspneic. There was no venous distention in the neck. The anteroposterior diameter of the chest was increased. The chest was hyperresonant, except at the right base. Diffuse rhonchi were heard throughout. Breath sounds were decreased at the right base. Auricular fibrillation was present, with an apical rate of 100 and a pulse rate of 80. The first heart sound at the apex had a snapping quality. The pulmonic second sound was louder than the aortic. No murmurs were heard. The blood pressure was 125 systolic, 90 diastolic.

The white-cell count was 12,000, with a normal differential. The hemoglobin was 15 gm. The urine had a specific gravity of 1.020 and gave ++ to +++ tests for albumin, and there were rare red and white blood cells in the sediment. The sedimentation rate was 1.9 mm. per minute. The stools were brown, and the guaiac test was ++. Sputum cultures were repeatedly negative for beta-hemolytic streptococci and pneumococci. Repeated blood cultures were negative.

An electrocardiogram showed a coarse auricular fibrillation and right-axis deviation. Chest x-ray study revealed an enlarged heart shadow and moderate congestion in both lungs. There was some fluid present at the right base. No atelectasis was seen.

During the hospital stay the patient ran a low-grade fever, ranging between 99 and 102°F. Dyspnea and cough, accompanied by blood-streaked sputum, persisted. Therapy included digitalis, aerosol penicillin and mercuhydrin. After three weeks in the hospital there was no improvement. Marked weakness developed. Chemical examination of the blood at this time showed a nonprotein nitrogen of 34 mg. per 100 cc., and a sodium of 110.6, chloride of 70 and carbon dioxide of 29.2 milliequiv. per liter. Vigorous therapy with salt by mouth (2 gm. and more daily) resulted in no improvement. The highest serum sodium obtained was 114.1, and the highest chloride 75 milliequiv. per liter.

He complained of severe abdominal discomfort and persistent anorexia. Extreme weakness continued. The liver was enlarged and tender. Five weeks after readmission he became unresponsive. The pulse became unobtainable, and over a period of two hours the respirations gradually slowed and ceased.

Differential Diagnosis

Dr. Conger Williams: Nothing is said about cyanosis so I assume that it was not present. In view of the complexity and length of this account, I might pause and consider briefly a few possibilities.

This was a middle-aged man who came in with a history of cough for ten years, dyspnea for eight years and an important cardiac arrhythmia — namely, auricular fibrillation. In a man of this age a very common cause of auricular fibrillation is mitral stenosis, especially with a history of this length. Could mitral stenosis alone account for such a long history of cough and dyspnea? It could, but there are two points that must be mentioned, which perhaps are a little against mitral stenosis as the only cause for his symptoms: the amount of productive sputum that the patient had over a period of several years and the severity of the cough. These two reservations suggest another possibility, — chronic pulmonary disease, either as the only lesion or complicating mitral stenosis. It is quite conceivable that he had the syndrome of chronic bronchitis, emphysema and asthma over many years. I cannot tell from the physical examination reported whether the chest showed the structural changes expected in such a situation.

Dr. Helen Pittman: We thought it did.

Dr. Williams: So perhaps that possibility is a little stronger. It was mentioned earlier in the history that this patient worked in a steel mill twenty years before admission, where he was exposed to large amounts of metal dust. This brings up the possibility of pneumoconiosis, but I can do nothing more than suggest the possibility since there was no known exposure to silica or asbestos. Did this man have enough pulmonary disease to give him chronic heart disease, namely, chronic cor pulmonale, which, complicated by auricular fibrillation, might account for congestive failure? Auricular fibrillation as a complication of cor pulmonale, especially at this age, is unusual but not impossible. Another thing that seems quite evident is that regardless of the cause of the chronic symptoms, he had an acute infection, possibly in the lungs, since he had chills just before entry, and fever and leukocytosis in the hospital. It is possible that he had pneumonia, complicating old chronic pulmonary infection.

If the red-cell count of 6,700,000 represents a real polycythemia, that finding is in favor of chronic pulmonary disease. We do not very often see polycythemia in heart disease unless there is a right-to-left shunt. However, this may not have been real polycythemia, but merely a result of hemoconcentration from fever, profuse sweating and so forth. I do not believe that congestive failure, although quite marked, could account entirely for the +++ test for albumin in the urine, but it is possible. Rusty sputum goes with either a chronic or an acute history of pulmonary involvement. It is possible that the nephrotic syndrome was suspected at this time, judging from some of the tests done. Either of the bromsulfalein figures could be consistent with various degrees of congestive heart failure.

After examination of the electrocardiogram and observation of the chest leads, it is more evident that he had right ventricular enlargement. The

pattern is very characteristic. I think cor pulmonale, congenital heart disease and mitral stenosis are the most likely possibilities.

May we see the x-ray films? The earlier films might have been helpful, but we do not have them. Do you see anything that suggests long-standing pulmonary disease or congestion on a vascular basis?

DR. STANLEY M. WYMAN: The pattern in the lung shows first of all enlarged hilar shadows. I take them to be engorged vessels. The peripheral vascular findings and the fluid in the right pleural space and probably to a slight degree in the left, perhaps in an interlobar fissure, suggest pulmonary congestion and cardiac decompensation. I cannot say whether these peripheral nodular changes are acute or chronic on this one film, but they disappear later except for a few small nodules that remain out in the periphery of the left lung.

DR. WILLIAMS: Do you wish to comment on the possibility of mitral stenosis?

DR. WYMAN: I think the films are good evidence for an enlarged left auricle seen through the heart. These two films outline the left main bronchus and form a double contour as seen on the right of the heart. That is also seen to some degree on the lateral projection. I cannot comment on the ventricular enlargement, but it could be left or right.

DR. WILLIAMS: Do you think the prominence of the pulmonary artery would account for that?

DR. WYMAN: I do not believe it could account for all of it; surely, it could not give a double contour of the auricle through the heart.

DR. WILLIAMS: Apparently this picture gradually subsided.

The mid-diastolic murmur is, of course, helpful in the diagnosis of mitral stenosis. On the other hand, it is well to recall that ventricular dilatation alone may produce a mid-diastolic rumble. The patient had auricular fibrillation, so no presystolic murmur could be heard. "Auricular fibrillation was present at each examination." This recurring statement is quite important.

The tender swelling in the leg three months before admission may have been important, and made me wonder whether pulmonary embolism, which is a common complication in a history of this kind, had at last appeared.

The positive guaiac reaction made me wonder whether the patient had been swallowing bloody sputum or whether he had had a mesenteric embolus secondary to long-standing auricular fibrillation. It is evident from the repeated blood cultures that the diagnosis of subacute bacterial endocarditis was entertained at this time, but no evidence for it was found. I think it is likely that the low-salt diet accounted in this case for weakness as it does in so many others.

Anorexia may have been due to the distended liver or some lesion in the abdomen such as a mesenteric lesion.

To sum up rapidly, I am quite sure that this patient had mitral stenosis, whatever else he may have had. I probably feel that way because of the early onset and persistence of auricular fibrillation in a man of forty-two at the time of the first hospital admission. Also, the x-ray pictures and the electrocardiogram are both in keeping. However, I do not believe that mitral stenosis accounts for everything.

At autopsy, I should not be surprised to find evidence of chronic bronchial disease or emphysema or possibly pulmonary fibrosis. Did he have subacute bacterial endocarditis? It is possible that he did. There was a history of teeth extractions, although they were covered by penicillin in each instance.

One other thing we ought to consider in a patient who has had peripheral venous congestion so long is constrictive pericarditis. Among many objections to this diagnosis is the proportion of dyspnea to other symptoms. It is true that many patients with constrictive pericarditis also have dyspnea but certainly not to this extent, nor are they troubled by cough as this patient was.

So for my principal diagnosis, I will say that this man had mitral stenosis, with rheumatic heart disease, and chronic bronchitis. I disregard the possibility of congenital heart disease because right-axis deviation in the absence of cyanosis does not fit in with the x-ray picture. It is remotely conceivable that he had auricular septal defect, but I doubt it. We have seen an occasional case of patent ductus arteriosus with nothing but a mitral rumble and without the usual characteristic murmurs. However, I dismiss this possibility. I considered the possibility of amyloidosis to account for the renal picture, which somewhat approaches that of the nephrotic syndrome. This does remain a possibility. I cannot very well account for it on any other grounds. I do not believe he had chronic nephritis. He maintained a good urine concentration throughout the illness. Many cases discussed at these conferences turn up with unexpected acute glomerulonephritis at autopsy, but there is no evidence for it here.

DR. HOWARD B. SPRAGUE: You have to include the possibility of reactivation of rheumatic fever, do you not?

DR. WILLIAMS: I meant to mention it. I should not be surprised to find Aschoff bodies in the myocardium. It is quite possible that the patient died in active rheumatic fever.

DR. EARLE M. CHAPMAN: Would you include the possibility of pulmonary infarction?

DR. WILLIAMS: No, but I would not be surprised to find small pulmonary emboli at autopsy.

DR. SPRAGUE: I saw the patient on his original entry and for some time followed him in the Out-Patient Department. The problem was considered to be cor pulmonale. I turned him on his side one day and found that he had a sharp aortic first sound and a mitral diastolic rumble. I am on record as saying that he had mitral stenosis, so I will stand or fall on that.

Clinical Diagnoses

Cardiac insufficiency.
Rheumatic heart disease, active.
Pulmonary emphysema.

Dr. Williams's Diagnoses

Rheumatic heart disease: mitral stenosis, auricular fibrillation, congestive failure.
Chronic bronchitis.
Pulmonary embolism?

Anatomical Diagnoses

Rheumatic heart disease, with mitral stenosis.
Multiple pulmonary embolism and infarction, massive, old and recent.
Cardiac hypertrophy, right ventricle (cor pulmonale).
Massive mural thrombus, left auricle, obliterating mitral valve and extending into pulmonary vein.
Hydrothorax, right.
Central necrosis of liver.

Pathological Discussion

Dr. Benjamin Castleman: The autopsy was limited to the chest; unfortunately I cannot answer some of the abdominal questions. We were able to examine a piece of liver and found marked central necrosis. The right pleural cavity contained 3 liters of rather clear fluid.

The startling gross finding was the presence of infarcts of various ages in every lobe of the lung. Most were located in the right lower lobe, one of which was apparently fairly old and had a central necrotic abscess in it, which is very unusual in a bland pulmonary infarct. This infarct was the largest, measuring 8 cm. in diameter, with a central cavity of 3 or 4 cm. Although we were unable to find on the gross examination any infarcts that seemed completely healed, we did find in some of the arteries within the lung evidence of old embolism with recanalization, some involving the tiny arteries. Some of the larger vessels had adherent thrombi that were perhaps a year or so old. So it is quite possible that a great deal of the right-sided hypertrophy was due to old embolism of the lung. There was some emphysema but not very much fibrosis of the lung.

The heart was enlarged, weighing about 500 mg., most of the enlargement being due to right-sided hypertrophy. The right ventricle measured 10 mm. in thickness, three or four times the normal size, and the right auricle was tremendously distended, much more than the left, which was also dilated. This was surprising, at first glance, because there was severe mitral stenosis. Filling the large left auricle and obliterating the already stenotic mitral valve was a huge mural thrombus, 8 by 5 by 4 cm. The large mural thrombus not only filled the left auricle but extended into the pulmonary vein from the right lower lobe, and since there were many emboli in the pulmonary artery to this lobe, there was probably very little blood getting in and out, thus accounting for the cavitation in the large infarct.

Dr. Williams: Was that recent?

Dr. Castleman: It must have been there for some time, because it was adherent and well organized, perhaps for months. We have therefore a number of possibilities to account for the large right ventricle: some emphysema, a severe mitral stenosis, and embolism, both chronic and recent, occurring in the pulmonary circuit.

Dr. Alfred Kranes: What was the source of the pulmonary emboli?

Dr. Castleman: I suppose from the leg veins. We were unable to examine them, but we know that there was a phlebitis clinically.

Dr. Chapman: Could they not have come from the right auricle?

Dr. Castleman: No, there was no mural thrombus in the right. There is the possibility that atherosclerosis of the pulmonary arteries, which occurs with mitral stenosis, may have initiated the formation of small thrombi. I have always believed, however, that pulmonary thrombosis rarely occurs and that most of the lesions in the pulmonary circuit are emboli rather than local thrombi.

CASE 35382

Presentation of Case

A seventy-five-year-old nulliparous widow was admitted to the hospital because of vomiting and abdominal pain.

In the two years prior to admission the patient had been "below par" and had lost 25 pounds. For one year she had had progressive constipation, passing small, hard stools occasionally mixed with blood. Two days before admission she noted obstipation, cramping lower abdominal pain and vomiting of all ingested material. There was no fecal return from several enemas, and various laxatives taken were vomited.

The past history included a right radical mastectomy for carcinoma twenty years previously and a total hysterectomy and salpingo-oophorectomy for cancer of the uterine fundus twelve years before admission. The appendix was said not to have been removed. The patient had noted anginal chest pain on exertion for five years, with occasional nocturnal dyspnea, and had been taking digitalis up to one month prior to admission.

Physical examination showed a dehydrated, elderly woman. The heart was enlarged to percussion. A rough systolic murmur transmitted into the neck was heard in the aortic area, and there were systolic and presystolic murmurs at the apex. The abdomen was distended, somewhat rigid, and showed rebound tenderness referred to both lower quadrants. There was tenderness in both vaginal vaults and some fullness more on the right. An indistinctly outlined mass was felt in the right lower quadrant.

The temperature was 102°F., the pulse 100, and the respirations 24. The blood pressure was 110 systolic, 70 diastolic.

Laboratory studies showed a normal urine. The hemoglobin was 13.5 gm. per 100 cc., and the white-cell count was 12,950. The stools gave a ++ guaiac reaction on two occasions. The nonprotein nitrogen was 44 mg., and the total protein 6.3 gm. per 100 cc., the serum chloride 104 milliequiv. per liter, and the prothrombin time 48 per cent of normal. Vaginal smears showed no neoplastic cells. Plain films of the abdomen showed gas-filled loops of small and large bowel. Chest x-ray films confirmed the cardiac enlargement.

A Miller–Abbott tube was inserted, and a transfusion of 500 cc. of whole blood administered. The patient was started on intravenous injection of fluids, penicillin, streptomycin, Digalen and opiates. Peristalsis was audible, and she occasionally passed gas by rectum. However the temperature and white-cell count remained elevated and the urinary output was very low. On the seventh day the pulse rate rose to 210, and an electrocardiogram showed auriculoventricular dissociation. Tachycardia was incompletely controlled by quinidine. The right-lower-quadrant mass seemed to decrease in size, as did a fullness in the right vault on the eighth day, when foul, liquid bowel movements began. Active normal peristalsis was heard at this time, and for five days she tolerated liquids by mouth with the Miller–Abbott tube out. On the sixteenth day she began to vomit fresh blood and coffee-grounds material and to pass fresh clots by rectum. The blood pressure fell to 80 systolic, 60 diastolic, and the patient complained of anginal pain.

Transfusion of 1000 cc. of whole blood produced some clinical improvement, but on the morning of the eighteenth day she suddenly became disoriented, the heart beat and respirations ceased, and she was pronounced dead.

Differential Diagnosis

Dr. Reed Harwood: May we see the x-ray films?

Dr. James A. McCort: The x-ray examination was limited to a plain film of the abdomen. The tip of a Miller–Abbott tube is present in the fundus of the stomach. Distal to the stomach there are at least two dilated loops of small bowel. Air is present in the ascending colon. There may also be a small amount of air in the descending colon and sigmoid. The mass described in the protocol is not visible on the x-ray film.

Dr. Harwood: Is that a pressure defect?

Dr. McCort: There is not a sufficient amount of air in the cecum for me to be certain.

Dr. Harwood: The history, then, is one of intestinal obstruction that relieved itself after eight days in the hospital. Ten days later the patient vomited fresh blood and also passed fresh blood by rectum and rapidly went into shock and died.

I am first going to present a list of conditions that I think we should consider, with a comment on each: metastatic carcinoma or recurrence of one of the previous carcinomas; a new carcinoma of the colon or a tumor of the ileum, with intussusception; and tuberculosis of the cecum, diverticulitis and mesenteric thrombosis.

Regarding metastatic carcinoma, the patient had two previous operations for carcinoma in the past. The first one was twenty years before admission, when her breast was removed, and the other was for carcinoma of the uterine fundus twelve years previously. It seems to me that the objection to postulating recurrence of metastasis from either of these two primary tumors is the duration since the tumor was removed. We know that occasionally there is a late recurrence of carcinoma. In both cases, I would expect a recurrence to appear either in the lungs, the liver or the bone marrow. Therefore, I am excluding metastatic carcinoma.

We know from previous exercises that it is not at all uncommon for a patient to have two or three carcinomas in different organs of the body. Perhaps this patient had a predisposition for the formation of malignant tumors. The history is good for carcinoma of the bowel. She had chronic constipation and a down-hill course for over a period of two years, with increasing constipation, finally ending in obstruction. The physical findings are consistent with such a diagnosis. We know with carcinoma of the right colon that the typical history is alternating periods of constipation and diarrhea, but there is no suggestion that she had diarrhea in the past two years. The obstruction was relieved in this case, and I should not expect that to occur in carcinoma that has slowly encircled the lumen of the cecum or ascending colon. Tumor of the ileum with intussusception and intussusception from a tumor in the region of the cecum are both possibilities that are attractive because of the fact that after eight days in the hospital the obstruction was relieved and she passed foul, liquid bowel movements. I would rather expect this patient to have been much sicker, possibly in shock, with a much higher white-cell count if she had had intussusception on admission.

Tuberculosis of the cecum can cause both bleeding and obstruction. I think it is unlikely in this case because of the absence of any suggestion of tuberculosis in the lung.

Diverticulitis, possibly with abscess formation and discharge of the contents of the abscess into the lumen of the bowel, might possibly explain the relief of obstruction in this case. Diverticulitis is much more common in the left colon than in the right. I merely mention this as a possibility; I cannot prove it.

Finally, we come to a consideration of mesenteric thrombosis, venous or arterial. If arterial, it could have been the result of arteriosclerosis of the mesenteric arteries or an embolus from some other source. We know, for example, that the patient had arteriosclerotic heart disease, and it is possible, although I think unlikely, that she had had a coronary occlusion in the recent past and an embolus from a

cardiac mural thrombus was thrown off to the mesenteric artery. She could have had thrombosis on the venous side, with infarction of a small area of bowel. It is conceivable that this could produce a temporary intestinal obstruction, that the viability of that part of the bowel would be in doubt for some days and then that circulation would be re-established by way of collateral vessels later. Then, perhaps, on the sixteenth day in the hospital a fresh venous thrombus occurred; possibly a massive thrombosis of the mesenteric or even the portal vein caused the vomiting of fresh blood and the passing of blood by rectum. In fact, a high thrombosis of the mesenteric vein is the only way I can explain bleeding from both the upper and the lower intestinal tract; so I am going to make this my diagnosis.

I might say something about the prothrombin time. It was 48 per cent of normal on admission. That suggests one of two things to me: liver disease or malnutrition. There is nothing in the protocol that suggests liver disease so I am going to say it was due to malnutrition. It is not at all uncommon for a woman or man over seventy to lose weight, to lose appetite and stop eating and to become chronically dehydrated. This may be the explanation for the weight loss and constipation, rather than a chronic malignant lesion of the bowel.

Dr. John W. Raker: When this woman came into the Emergency Ward most of the people who saw her preferred a diagnosis of perforated appendix, with appendiceal abscess. We called the hospital where she was operated on previously, and it was definitely ascertained that the appendix was left behind according to the hospital record. It was our opinion at the time of admission that she was too ill to stand an operation, although there was considerable discussion about it. We thought she had a certain amount of congestive failure as well as dehydration. There was evidence that something was localizing in the right lower quadrant. We followed her on a conservative regime for five days and began to think that we might drain her through the right lower quadrant. The symptoms subsided spontaneously with the appearance of foul stools, and we thought perhaps she had drained herself into the bowel. We waited in the hope that we could reach the stage where we could safely operate on her. The electrocardiogram showed the findings recorded. We were never able to explain why she was bleeding, although we persisted to the end in our belief that she probably had a perforated appendix.

Dr. Tracy B. Mallory: There must have been some consideration of carcinoma of the cecum because that was the written diagnosis on the death report.

Dr. Raker: I believe the majority of people who saw her favored the diagnosis of appendiceal abscess. There was a minority in favor of carcinoma of the cecum, and the doctor who signed the death report must have belonged to that minority.

Clinical Diagnosis

Appendiceal abscess?
Carcinoma of cecum?

Dr. Harwood's Diagnosis

Mesenteric thrombosis.

Anatomical Diagnoses

Abdominal abscess.
Generalized peritonitis.
Jejunoileal fistula.
Anterior myocardial infarct, recent.
Duodenal ulcers, active.
Aneurysm of descending aorta.

Pathological Discussion

Dr. Mallory: The autopsy findings were rather puzzling, and I do not feel entirely satisfied that we can explain everything we found. She had a large intra-abdominal abscess, and the stump of the appendix projected into this abscess. It was only 1 cm. in length and was densely fibrous and had no lumen. It would be rather unusual for an appendix of that type — that is, an obliterated appendix — to perforate, and we could find nothing that we could recognize as necrotic portions of the appendix. As the autopsy was continued we found that there was a fistulous tract between the jejunum, about 20 cm. below the ligament of Treitz, and one of the lower loops of the ileum, and this fistula was in immediate approximation with the intra-abdominal abscess, so that leakage could have occurred through that. The walls of the fistula were slightly inflamed and thickened. There was no evidence of neoplasm, tuberculosis or any specific infection. The origin and nature of that lesion, I cannot explain. How long this fistula had been present, we are unable to say, and whether it or the appendix was the source of the abdominal abscess also has to remain a doubtful question.

She also had a severe arteriosclerotic heart disease, with numerous spots of marked narrowing of the left descending coronary artery and a focus of fresh infarction, a little over 2 cm. in diameter, in the interventricular septum. An incidental finding was an arteriosclerotic aneurysm of the abdominal aorta containing a mural thrombus.

Dr. Raker: Was not something found in the duodenum?

Dr. Mallory: There were two acute peptic ulcers in the duodenum that accounted for the vomiting of blood. We did explain that.

A Physician: Another possibility to explain that bleeding is acute pancreatitis.

Dr. Mallory: The pancreas showed only interstitial edema, such as one commonly sees in a case with peritoneal infection.

A Physician: Was there dissection in the aneurysm?

Dr. Mallory: No, it was a simple pouch-like arteriosclerotic aneurysm.

The New England Journal of Medicine

Formerly
The Boston Medical and Surgical Journal
Established 1828

Official Organ of
THE MASSACHUSETTS MEDICAL SOCIETY
and
THE NEW HAMPSHIRE MEDICAL SOCIETY

OWNED BY THE MASSACHUSETTS MEDICAL SOCIETY AND PUBLISHED WEEKLY UNDER THE JURISDICTION OF THE COMMITTEE ON PUBLICATIONS

Richard M. Smith, M.D., *Chairman*
James P. O'Hare, M.D. — Conrad Wesselhoeft, M.D.
Oliver Cope, M.D. — John Fallon, M.D.

Joseph Garland, M.D., EDITOR

ASSOCIATE EDITORS
Thomas H. Lanman, M.D. — Donald Munro, M.D.
Henry Jackson, Jr., M.D.

Clara D. Davies, EXECUTIVE EDITOR
Robert O'Leary, ASSISTANT EDITOR

EDITORIAL BOARD
C. Guy Lane, M.D. — Maxwell Finland, M.D.
Henry R. Viets, M.D. — Carroll B. Larson, M.D.
Robert M. Green, M.D. — C. Stuart Welch, M.D.
Dwight O'Hara, M.D. — Vernon P. Williams, M.D.
Fletcher H. Colby, M.D. — Benjamin Castleman, M.D.
Robert L. Goodale, M.D. — Hugh R. Leavell, M.D.
Chester M. Jones, M.D. — J. Englebert Dunphy, M.D.
Harvey R. Morrison, M.D. — Charles H. Burnett, M.D.

SUBSCRIPTION TERMS: $7.00 per year in advance, postage paid, for the United States (medical students, $4.00 per year); Canada, $8.00 per year (Boston funds); $9.50 per year for all foreign countries belonging to the Postal Union.

MATERIAL should be received not later than noon on Thursday, three weeks before date of publication.

THE JOURNAL does not hold itself responsible for statements made by any contributor.

COMMUNICATIONS should be addressed to the *New England Journal of Medicine*, 8 Fenway, Boston 15, Massachusetts. Telephone KE 6-2094.

EPIDEMIOLOGY OF TRAUMA

ONLY a study of all the factors that affect health can lead to an intelligent program for its preservation. In the field of trauma, as Gordon[1] has previously pointed out, any organized approach to the problem of accidents, occurring singly or in catastrophic numbers, was originally centered on relief. It was for relief that the Red Cross was organized — first for the relief of stricken soldiers, then, under the American Amendment, for the relief of civilians in time of disaster. Not until later did the idea of prevention begin to prevail, and then it was advanced mainly by industry.

Elsewhere the same author[2] has indicated the growth of the concept of the epidemiologic method from its original restriction to the communicable diseases to a broader application to the other afflictions of mankind as well as including such conditions as cancer and diabetes and even the congenital malformations. Epidemiology, as a study of cause and effect in their relation to health, can be equally well applied to an investigation of the traumatic hazards.

These possibilities can be variously illustrated by analyses of "point" epidemics, representing "that circumstance where a sharp aggregation of cases occurs within a brief interval as the result of a single agent acting during a prescribed and limited time." In this category is the explosive eruption of typhoid-fever cases two weeks after a circus train inadvertently filled its tanks from a standpipe delivering untreated river water. The accidental deaths occuring as a result of the Cocoanut Grove fire in Boston in 1942 were in the same class, as was the outbreak of trench foot in an infantry division following the Battle of the Bulge.

Three factors, or some combination of the three, are involved when the "established and satisfactory equilibrium or adjustment between man and his environment" that is called health is disturbed. These are the direct causative factor or agent, the environmental factor, and the host factor.

A study of them all is important if a practical program of control is to be worked out. Not only can the epidemiology of accidents be analyzed in the same manner as that of disease, but practical preventive measures will result from a survey of the causative factors.

In this issue of the *Journal* Roberts and Gordon present an investigation into the epidemiology of home accidents as they occur in Massachusetts. The Massachusetts accident death rate is lower than that for the country as a whole, but the Commonwealth's low automobile death rate is responsible. Fatal home accidents are actually proportionately more important in Massachusetts than in the nation.

Not only do the authors present a statistical analysis of the local status, but advice regarding the studies on which efficient control methods can be based.

In respect to the epidemiology of trauma it is interesting to note that considerable attention is now being focused on accidents occurring on the farm. Here, where a high rate of unnecessary mishaps is being reported, is a fruitful field for the

type of study that Gordon has so successfully developed.

References

1. Gordon, J. E. Home accidents as community health problem. *Am. J. M. Sc.* **217**:325-344, 1949.
2. *Idem.* Epidemiology of accidents. *Am. J. Pub. Health* **39**:504-515, 1949.

PEDIATRIC SURVEY

The nationwide study of health services for children conducted by the American Academy of Pediatrics during the past three years, state by state, has been published by the Commonwealth Fund and reviewed in the *Journal* of September 8. In the current issue can be found a brief but explicit summary of the report on the Massachusetts survey.

Wholly aside from the statewide study, Massachusetts appears to have figured prominently in the national picture. Dr. Warren R. Sisson, of Boston, was chairman of the Committee for the Study of Child Health Services when the pilot study in North Carolina was undertaken in 1945, and is currently president of the Academy as the reports are being issued; Dr. John P. Hubbard, also *loc. cit.*, has been executive director of the entire survey from its inception.

The study has been decentralized to an unusual degree, each state chairman having been required to develop his own organization, plan the financing of the work and arrange for the publication of the findings. The report on the Massachusetts Survey is published by the American Academy of Arts and Sciences.

In general, throughout the state surveys, data have been tabulated by counties and by the metropolitan character of counties, a classification that depends on both population density and proximity to centers of population. Only three of the fourteen counties of Massachusetts — Barnstable, Dukes and Nantucket, are classed as "isolated," and it has been found practical in this state to utilize the public-health districts in preference to county divisions.

Certain not altogether palatable data have been brought out by the survey. Massachusetts is the twelfth wealthiest state in the Union but ranks twenty-second in maternal and twentieth in infant mortality. Boston in particular has an infant-mortality rate one point higher than the national average, despite the fact that the Commonwealth ranks third among the states with respect to the total amount of medical service that its children receive, and second with respect to the number of practicing physicians in relation to population. It ranks fifth with respect to the number of dentists in practice.

The training of physicians and dentists in the specialized care of children has been found on the whole to be deficient, the average general practitioner requiring more pediatric training both in medical school and in the hospital than he is now receiving.

The distribution and utilization of pediatric hospital beds is uneven, a prime need in the field of chronic care being for more beds for mentally deficient and epileptic patients. A program for graduate pediatric education is desirable; this could be sponsored by the Massachusetts Medical Society, the New England Pediatric Society and the Massachusetts Chapter of the American Academy of Pediatrics.

Criticism in any field of endeavor is of value in direct relation to the available knowledge on which it is based. The work that Baty and Snedeker have done in Massachusetts in straight fact-finding, which can be multiplied by the number of states in the union, is impressive. It is now the responsibility of the medical profession and of the public to convert this information into an active program.

The channels through which medical service flows and the methods by which it becomes available may change from generation to generation and may be often the subject of debate. The obligation of the profession to provide the best service possible to all who need it never changes.

PUBLIC HEALTH AND PRIVATE PRACTICE

Dr. Henry I. Bowditch, of Boston, — then chairman of the Massachusetts State Board of Health, — enunciated the following principle in the Centennial Discourse on Public Hygiene delivered at the Philadelphia Exposition in 1876:

> Still further I hold it to be true that the study of the prevention of disease is the only branch of medical learning

> which the State can legitimately undertake. The practice of medicine and surgery and the appropriate use of drugs, must be left to medical schools and to private practitioners of medicine. The State, as a student of the causes of all disease, only supplements, and indeed nobly supplements them.*

In those days, too, there were giants in the earth.

Aside from the present aims and future goals of state and federal Government in relation to health and disease, it is obvious that considerably more oversight of health in general is being exercised in 1949 than was the case in 1876. Nor is all of this paternalistic solicitude to be condemned. Public health and private practice when each is properly conducted have but one common goal and, when each is conducted properly, that goal can be approached with mutual harmony and consideration.

Even Dr. Bowditch, amazed as he might be at group health insurance and shocked as he certainly would be at the current efforts of Government to introduce compulsory health insurance, would nevertheless have considered it a proper function of the State to care for its military personnel, its veterans (to a degree) and its indigent. He, too, would have believed it to be a function of public health to co-operate with the private practitioner, and would have expected the practitioner on his part to co-ordinate his efforts with those of public health, and to reap its benefits. Certainly the physician who today opposes this policy must accept the burden of proving that he is right in doing so.

It is this capacity of public and private service for working together that has been ably demonstrated in the public-health heart program instituted a year ago in Newton, Massachusetts, and reported elsewhere in this issue of the *Journal*.

This program, conceived as a pilot study of the public-health aspects of heart disease was endorsed by the Massachusetts Medical Society in May, 1948, and activated under the joint sponsorship of the Newton Health Department, the Massachusetts Department of Public Health and the United States Public Health Service. Its objectives are "to determine methods of helping to reduce cardiovascular disease and conserve cardiac function"; its program is based on the belief that heart disease constitutes a public-health problem, and that public-health measures will yield results in its control. It early received the endorsement of the Newton Medical Club and has progressed to the point of its present report through the co-operation of the practicing profession.

*Emerson, H. Whither the Pegasus of public health? Cutter Lecture on Preventive Medicine. *New Eng. J. Med.* **238**:679-687, 1948.

MEDICAL ILLUSTRATION

AN ESSENTIAL part of medical publication is adequate illustration. The point of an article is often made quite as much by an expert drawing of a part of the body or a carefully worked out diagram as by a description in words; indeed, a clear, professionally presented illustration is occasionally of more value than paragraphs of text.

Those who write for publication in medical journals will therefore be interested in the fourth annual convention of the Association of Medical Illustrators, which will be held in Boston from October 3 through October 6. Founded in 1946, the Association is dedicated to the following purpose: "to advance medical education and to promote understanding and co-operation with the medical and related professions."

The program of the convention includes talks by members of the Association on the administration of their departments, with discussions led by Dr. Joseph S. Lichty, an exhibition of work by members, an address by Dr. Robert M. Green and meetings in the Ether Dome of the Massachusetts General Hospital, with a demonstration of air-brush technic, a description of a new "Colotone" printing process and a lecture on the use of plastic materials. Of particular interest is the memorial lecture, delivered by Dr. Reginald Fitz, which commemorates the work of Max Brodell, who for thirty years conducted the Department of Art as Applied to Medicine at Johns Hopkins University School of Medicine and under whom many members of the Association studied.

It is hoped that the convention of specialists in what may be considered an adjunct to medical science will be as successful and informative as the meetings held in previous years in Philadelphia, New Orleans and Chicago.

A firm in New York say that they have received a specimen of reputed cod-liver oil from Boston, that does not contain a particle of that article! — It is asserted, on the authority of Mr. Fairchild, that seven hundred drunkards die annually in the sober state of Connecticut.

Married, — Dr. Hardenbrook, of Rochester, N. Y., to Mrs. Nott. He has been tried and acquitted of poisoning her husband.

Boston M. & S. J., *September 19, 1849*

OBITUARY

FREDERIC AUGUSTUS WASHBURN
1869–1949

Dr. Frederic Augustus Washburn, former director of the Massachusetts General Hospital, died on August 20, 1949. He had served as director of the hospital from 1908 until his retirement in 1934.

Dr. Washburn was born in New Bedford in 1869. He graduated from Amherst College in 1892 and received his medical degree from Harvard Medical School four years later. His service at the Massachusetts General Hospital began in 1897, when he was appointed house officer on the South Surgical Service. He became director of the Massachusetts Eye and Ear Infirmary in 1915.

He was surgeon and first lieutenant with the Sixth Massachusetts Volunteers in the Porto Rico Campaign (1898-99), assistant surgeon and captain with the Twenty-Sixth U. S. Volunteers in the Philippines (1899-1903) and major and colonel in World War I, during which he organized and commanded Base Hospital No. 6; later he was in charge of all United States Army hospitals in Great Britain, receiving the Distinguished Service Medal and the orders of St. Michael and St. George.

In 1930 Dr. Washburn founded the Baker Memorial Hospital for the care of people of moderate means, with hospital charges at cost and a limited professional fee. After his retirement he was appointed Commissioner of Institutions for the city of Boston. From 1937 to 1946 he was director of the Cambridge Hospital (now the Mount Auburn Hospital).

He was a former president of the American Hospital Association and was a fellow of the American Medical Association.

Dr. Washburn was noted for his ability as an administrator as well as for the charm of his personality. He will be greatly missed by all those with whom he was associated, both in his professional capacity and as a friend.

N. W. F.

NEW HAMPSHIRE MEDICAL SOCIETY

DEATHS

BAKER — Benjamin W. Baker, M.D., of Laconia, died on August 17. He was in his seventy-sixth year.

Dr. Baker received his degree from Dartmouth Medical School in 1898. He was formerly medical director and superintendent of the Laconia State School and was a member of the New England Society of Psychiatry and the American Psychiatric Association and a fellow of the American Medical Association.

His widow, a daughter and a brother survive.

WEAVER — George A. Weaver, M.D., of Bradford, Vermont, died on June 22. He was in his eighty-first year.

Dr. Weaver received his degree from Yale University School of Medicine in 1897. He was a fellow of the American Medical Association, and on June 15, 1949, had received a medal commemorating his fifty years' membership in the New Hampshire Medical Society.

His widow, a son, a daughter, two grandchildren and a sister survive.

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

CONSULTATION CLINICS FOR CRIPPLED CHILDREN IN MASSACHUSETTS

The October schedule for Consultation Clinics for Crippled Children in Massachusetts under the provisions of the Social Security Act follows:

CLINIC	DATE	CLINIC CONSULTANT
Salem	October 3	Paul W. Hugenberger
Haverhill	October 5	William T. Green
Lowell	October 7	Albert H. Brewster
Greenfield	October 10	Charles L. Sturdevant
Gardner	October 11	Carter R. Rowe
Brockton	October 13	George W. Van Gorder
Springfield	October 18	Garry deN. Hough, Jr.
Pittsfield	October 19	Frank A. Slowick
Worcester	October 21	John W. O'Meara
Fall River	October 24	David S. Grice
Hyannis	October 27	Paul L. Norton

Physicians referring new patients to clinics should get in touch with the district health officer to make appointments. Patients are seen by appointment only.

BOOKS RECEIVED

The receipt of the following books is acknowledged, and this listing must be regarded as a sufficient return for the courtesy of the sender. Books that appear to be of particular interest will be reviewed as space permits. Additional information in regard to all listed books will be gladly furnished on request.

Reproduction and Survival. By R. Christie Brown, M.B., M.S., F.R.C.S., F.R.C.O.G., obstetric surgeon, City of London Maternity Hospital, honorary surgeon, Samaritan Free Hospital for Women, and gynecologist, Metropolitan Hospital. 12°, cloth, 108 pp. London: Edward Arnold and Company, 1948. $2.25.

Psychiatry: A short treatise. By William A. O'Connor, L.M.S.S.A. (Lond.), D.P.M. (Lond.), medical superintendent, Ashwood House, Kinswinford, Staffs., and tutor (psychology) of extra-mural, University, and W.E.A. classes. 8°, cloth, 380 pp. Baltimore: Williams and Wilkins Company, 1948. $9.00.

Conditioned Reflexes and Neuron Organization. By Jerzy Konorski, head of the Department of Neurophysiology in the Nencki Institute of Experimental Biology, and professor in the University of Lodz. Translated from the Polish manuscript under the author's supervision by Stephen Garry. 8°, cloth, 267 pp., with 18 illustrations. Cambridge: University Press; New York: Macmillan Company, 1948. $4.00. (Cambridge Biological Studies.)

Dementia Praecox: The past decade's work and present status: A review and evaluation. By Leopold Bellak, M.D., associate in psychiatry, New York Medical College, and assistant psychiatrist, Flower and Fifth Avenue Hospitals, New York City. With a foreword by Winfred Overholser, M.D., superintendent, St. Elizabeths Hospital, and professor of psychiatry, George Washington University School of Medicine, Washington, D. C. 8°, cloth, 456 pp., with 8 illustrations. New York: Grune and Stratton, 1948. $10.00.

The Story of Medicine. By Joseph Garland, M.D. 8°, cloth, 259 pp., with illustrations. Boston: Houghton Mifflin Company, 1949. $2.75.

Lung Dust Lesions Versus Tuberculosis. By Lewis G. Cole, M.D. 4°, cloth, 474 pp., with 428 illustrations. White Plains, New York: American Medical Films, Incorporated, 1948. $10.00.

Present Concepts of Rehabilitation in Tuberculosis: A review of the literature, 1938–1947. By Norvin C. Kiefer, M.D., M.P.H., senior surgeon, United States Public Health Service, and assistant to the chief, Tuberculosis Control Division, United States Public Health Service, Federal Security Agency. 8°, cloth, 398 pp. New York: National Tuberculosis Association, 1948. $3.50.

The Clinical Management of Varicose Veins. By David W. Barrow, M.D. With a foreword by Arthur W. Allen, M.D. 8°, cloth, 155 pp., with 58 illustrations and 6 tables. New York: Paul B. Hoeber, Incorporated, 1948. $5.00.

Muscles: Testing and function. By Henry O. Kendall and Florence P. Kendall, Physical Therapy Department, Children's Hospital School, Baltimore, Maryland. 4°, cloth, 278 pp., with 162 illustrations. Baltimore: Williams and Wilkins Company, 1949. $7.50.

Clinical Auscultation of the Heart. By Samuel A. Levine, M.D., clinical professor of medicine, Harvard Medical School, and physician, Peter Bent Brigham Hospital; and W. Proctor Harvey, M.D., research fellow in medicine, Harvard Medical School, and assistant in medicine, Peter Bent Brigham Hospital. 8°, cloth, 327 pp., with 286 illustrations. Philadelphia: W. B. Saunders Company, 1949. $6.50.

NOTICES

BOSTON CITY HOSPITAL HOUSE OFFICERS' ASSOCIATION

The first in a series of Tuesday evening lectures for the 1949–1950 season sponsored by the Boston City Hospital House Officers' Association will be held in the Dowling Amphitheater, Boston City Hospital, on Tuesday, October 4, at 7 p.m. Dr. Harold Jeghers, professor of medicine, Georgetown University School of Medicine, will speak on the subject "Fever of Undetermined Etiology."

All interested persons are invited to attend.

ASSOCIATION OF MEDICAL ILLUSTRATORS

The annual meeting of the Association of Medical Illustrators will be held in Boston October 3 through 6. Dr. Reginald Fitz will deliver the opening address at the Lincolnshire Hotel on the first day of the meeting. The subsequent sessions will consist of committee reports; discussions, led by Dr. Joseph S. Lichty, of the administration of departments; demonstrations of color presswork, air-brush technic and a description of a new "Colotone" printing process; and a lecture on the use of plastic materials. A medical motion picture, a tour of the Massachusetts General Hospital and the annual dinner will also be included among the activities of the convention.

AIR FORCE MEDICAL SERVICE

The United States Air Force Medical Service will commission 300 civilian physicians, now serving as interns, as first lieutenants on active duty with the Air Force Medical Reserve Corps.

Eligible to receive commissions are medical-school graduates now serving internships at approved hospitals, who have at least six months of internship remaining. Physicians who are so commissioned will serve two months of active duty for each month of internship as commissioned members of the Medical Reserve Corps.

Upon completion of active-duty tours, officers who apply and are selected as members of the regular Air Force Medical Corps will be eligible for participation in the Air Force residency program to be conducted at civilian and military hospitals.

Officers who do not apply for commissions in the regular Air Force, and who do not participate in the residency program, may continue to serve on active duty as reserve officers for specific periods.

Complete information concerning the intern program may be obtained upon written request to the Officer's Procurement Branch, Office of the Surgeon General, Headquarters, United States Air Force, Washington, 25, D. C.

SOCIETY MEETINGS AND CONFERENCES

SEPTEMBER 28. 94th Infantry Division Lecture. Page 394, issue of September 8.

SEPTEMBER 28. New England Pediatric Society. Page 434, issue of September 15.

SEPTEMBER 28–30. Mississippi Valley Medical Society. Page xi, issue of July 14.

OCTOBER 3–6. Association of Medical Illustrators. Notice above.

OCTOBER 3–MAY 19. Massachusetts Department of Mental Health. Postgraduate Seminar in Neurology and Psychiatry. Page 286, issue of August 18.

OCTOBER 4. Boston City Hospital House Officers' Association. Notice above.

OCTOBER 11–15. American Society of Clinical Pathologists. Drake Hotel, Chicago.

OCTOBER 13. Mononucleosis. Dr. Andrew Contratto. Pentucket Association of Physicians. 8:30 p.m. Haverhill.

OCTOBER 14. Tuberculosis Rehabilitation Society. Page 434, issue of September 15.

OCTOBER 19. Massachusetts Chapter of American Academy of General Practice. Page 434, issue of September 15.

OCTOBER 24–26. National Gastroenterological Association. Page 251, issue of August 11.

OCTOBER 24–28. American Public Health Association. Page 251, issue of August 11.

OCTOBER 28. Massachusetts Psychiatric Society. Page 434, issue of September 15.

NOVEMBER 2. New England Obstetrical and Gynecological Society, Hotel Somerset, Boston.

NOVEMBER 2–5. Pan-American Congress of Pediatrics. Page 251, issue of August 11.

NOVEMBER 3–5. American Asscciation of Blood Banks. Page xi, issue of June 16.

NOVEMBER 7–9. National Society for Crippled Children and Adults. Page 184, issue of July 28.

NOVEMBER 7–12. International College of Surgeons. Page 251, issue of August 11.

NOVEMBER 14–17. American Academy of Pediatrics. Page 251, issue of August 11.

NOVEMBER 16. Massachusetts State Society of Examining Physicians. Page 324, issue of August 25.

DECEMBER 28 AND 29. American Association for the Advancement of Science. Page 350, issue of September 1.

FEBRUARY 20–23. American Academy of General Practice. Page 252, issue of August 11.

MAY 16–18. Massachusetts Medical Society. Annual Meeting. Hotel Statler, Boston.

JULY 17–22. International Congress for Scientific Research. Page xvii, issue of September 1.

CALENDAR OF BOSTON DISTRICT FOR THE WEEK BEGINNING THURSDAY, SEPTEMBER 29

FRIDAY, SEPTEMBER 30

*9:00 a.m.–12.00 m. Combined Medical and Surgical Staff Rounds. Peter Bent Brigham Hospital.

*1:30 p.m. Tumor Clinic. Out-Patient Department, Mount Auburn Hospital, Cambridge.

MONDAY, OCTOBER 3

*11:30 a.m.–12:15 p.m. Chest X-Ray Conference. South End Health Unit, 57 East Concord Street, Boston. Dr. Cleaveland Floyd in charge.

*12:15–1:15 p.m. Clinicopathological Conference. Main Amphitheater, Peter Bent Brigham Hospital.

TUESDAY, OCTOBER 4

*12:15–1:15 p.m. Clinicoroentgenological Conference. Peter Bent Brigham Hospital.

*1:30–2:30 p.m. Pediatric Rounds. Burnham Memorial Hospital for Children, Massachusetts General Hospital.

*7:00 p.m. Boston City Hospital House Officers' Association. Dowling Amphitheater, Boston City Hospital.

WEDNESDAY, OCTOBER 5

*12:00 m.–1:00 p.m. Clinical Conference. (Children's Hospital.) Amphitheater, Peter Bent Brigham Hospital.

*Open to the medical profession.